DEPARTMENT OF INFORMATION TECHNOLOGY

GE606-PROFESSIONAL ETHICS IN ENGINEERING

SEM/YEAR-08/04

UNIT I

ENGINEERING ETHICS

1. **Name the four ethical theories and briefly describe the most important features of each of these theories?**

Ethical theories have so many uses. Out of them, the following three are the most important uses:

1. Understanding moral dilemmas.
2. Justifying professional obligations and ideas and
3. Relating ordinary and professional morality

RESOLVING MORAL DILEMMAS

Ethical theories are very much helpful in understanding the moral dilemmas to some extent. But the ethical theories cannot give good moral judgment in solving complex moral dilemmas.

Before arriving at some conclusion on ethical theories resolving moral dilemmas let us go through the famous case study known as "The DC — 10 plane crash".

This case was analyzed by many persons. The case study is as follows:

In 1974, the first crash of a fully loaded DC-1O jumbo jet occurred over the residential area outside the central part of Paris; 346 people were killed. It was a world record for a single-plane crash. It was known in advance that such an accident was bound to occur because of the defective design of the jet.

The body of the plane was developed by a subcontractor, for the main contractors . Two years earlier to the plane crash, Senior Engineer of the contractor, who was directing the project, had written a memo to the Vice president of the company listing the dangers that could result from the design. He detailed accurately several ways by which the cargo doors could burst open during the time of flying, depressurizing the cargo space, and thereby collapse the floor of the passenger cabin: Since control lines ran long the cabin floor, this would result in a loss of full control over the plane.

The Management engineer recommended redesigning the doors and strengthening the

cabin floor. He stated that without such changes, it was inevitable that some DC-1O cargo doors would open in midair, resulting in crash.

In responding to this memo, top management of contractor disputed neither the technical facts cited by the management engineer nor his predictions. Company officials maintained, however, that the possible financial liabilities the contractor might incur prohibited them from passing on this information to higher-ups. These liabilities could be severe since the cost of redesign and the delay to make the necessary safety improvements would be very high and would occur at a time when the major contractor would be placed at a competitive disadvantage.

As a loyal employee, the management engineer (Mr. Applegate) had a responsibility to follow company directions, at least reasonable ones. Perhaps he also had family responsibilities that made it important for him not to endanger his job. Yet as an engineer he was obligated to the products which he designed. Thus the dilemma he confronted involved a clash between two general professional obligations — one to his employer and one to the public - and possibly a clash between professional and personal obligations as well.

Now we come back to our question. How do ethical theories help in resolving moral dilemmas? With the help of the case of DC- 10, we can answer this question.

(i) Ethical theories help in finding out the moral considerations or reasons that are involved in the dilemma. The virtue ethics interprets the management engineer's dilemma in terms of competing ideals of character and relationships such as loyalty to employers and colleagues versus loyalty to the public.

Utilitarianism explains the meaning of dilemma in terms of competing goods such as the safety of the personal benefits to contractor and the personal benefits to the management engineer (Mr. Applegate).

Duty ethics points out that the engineer had competing duties to protect the public who are affected by his work and also to respect his employer's authority to make management - level decisions about the expenditure.

Right ethics points out the rights of the public to be protected and the rights of the management to have their decisions respected by their employees

(ii) Ethical theories provide a more accurate sense of what kinds of information are

relevant to solve the moral dilemmas. All the four ethical theories have agreed that facts about the potential danger to the public are directly and urgently relevant. In the DC-1O case if we consider only the benefits to the sub contractor and to the management engineer (Mr.Applegate) in reaching a decision about the problem, it would be improper.

(iii) Ethical theories pave the ways to rank the relevant moral considerations in the order of importance. It helps in arriving at a rough guidance for, solving moral problems. These theories suggest a general priority of the obligation to protect the public by giving the special importance of rights to life and to be informed about the risks in one's life, the importance of duties to protect the valuable public and the degree of immorality involved in death and risk of death compared to economic benefits to corporations. This obligation does not overrule the other obligations. It only supports the view, in terms of engineering codes of ethics, for understanding the professionalism.

(iv) Ethical theories help to identify the full moral subdivisions of alternative course of action, encouraging a wide perspective on the moral implications of the options, and provide a systematic framework for comparing the alternative course of action.

(v) Ethical theories develop the moral terms, and provide frameworks for moral reasoning when discussing with colleagues about the moral issues.

(i) Ethical theories help to strengthen our ability to reach balanced and meaningful judgements by providing frameworks for development of moral arguments.

JUSTIFYLNG MORAL OBLIGATIONS

Ethical theories are very much helpful in justifying the moral obligations of engineers and others who are involved in technological development. By considering safety-regulated obligations as an example, we can make clear the application of ethical theories like utilitarnism, rights ethics and duty ethics in providing a moral basis for professional responsibilities.

Why the engineers are bound to have obligations to protect the safety of the public who are affected by their products? What kind of justification can be given for the previous claims that engineers have these obligations?

These questions are of a wide importance to engineering ethics, apart from its reference to DC - 10 case. Safety is said to be involved and invoked in many of the hard issues in engineering ethics. Safety has an important consideration in many of the situations which involve whistle — blowing, confidentiality and the exercise of professional autonomy. We can represent engineering ethics as greater than the other forms of ethics in the following manner. Engineering ethics fundamentally focuses on the promotion of safety while producing useful technological products to the public. Medical' ethics are concerned within promoting health within the patients autonomy and legal ethics focuses the rights of clients within the bounds set by the law.

How the obligation of safety of engineers is justified by attractiveness to ethical theories has been explained in the following picture justifying moral claims about safety in engineering

RELATING PROFESSIONAL AND ORDINARY MORALITY

The special obligations involving safety that engineers acquire as a result of their work are intimately connected with ordinary or everyday morality. The ethical theories are useful to express everyday moral experience and also to justify the obligations of professionals. This can be understood by considering the following views which are concerned with the origin and justification of the safety and other obligations of engineers.

1. From the first view, engineers acquire moral obligations regarding safety through some laws and enforced codes which make them to be obligated. This forms the legalistic approach to morality. It is an attempt to model morality on the law or reduce it to legal and paralegal considerations. This approach is very much related to ethical relativism.

2. The second point is that engineers acquire special obligations by becoming the members and getting involved in a professional society and agree to live by that society's code of ethics. This view places the origin of engineer's obligations to safety in a personal commitment to act according to the principles implying ethical obligation. It connects directly into our basic understanding of how promises and other selfcommitting acts develop obligations.

3. Thirdly, engineers acquire safety obligations through the contractual agreements by

which they are hired by their employers. For example, an engineer who has been hired as a safety inspector must acquire some special work responsibilities related to safety and these responsibilities cannot be reduced or lowered. Not meeting them will result in loss of job or a promotion.

The explicit obligations to employers cannot be the basis for the safety obligations of engineers. No engineer is obligated by his employee status to sacrifice safety by following irresponsible employers, who do not care about moral principles and give directives to lie, cheat, forge and put innocent lives in risk by producing or approving dangerous designs and constructions. Similar cases occurred in Pepsi cool drinks and Dairy milk chocolates. These words are to impress among the employees about the general safety obligations to the public by overriding obligation to the employers.

4. Fourth point is that engineers while entering into their careers, indirectly promise the public to protect and safeguard in performing their works. In return to the above, the public has the liability for providing engineers educations through financial supports for schools. It means that it allows the professional societies like AICTE to accredit Schools of engineering and to take part in setting standards for the title of "Professional Engineer" and to establish technical standards. It would be unfair for the professionals not to respond by committing themselves to promote those aspects of the public good that fall under their activity. For example, in case of engineers it is to promote public safety. Each of the above points establishes that without referring to ethical theory it was to inadequate. -

5. Finally, we can distinguish between two different senses in which it is claimed that engineers have special safety obligations with regard to their work. If "Special obligations "refer to the obligations which are not based on the general human rights by placing obligation on all the people, then the special obligations of engineers are arising out of special employment agreements or agreements with professional societies But at the same time, the main safety obligations of engineers do not arise from special membership or from some special law, tradition or employment condition inapplicable to non-engineers.

The word "Special" refers to the obligations relating to engineering profession to give a special care and attention to the safety matters. The engineers must have in them an

excellent characteristic of how their functions are directly related to the rights of the persons who are affected by their work.

2. List the steps used in confronting moral dilemmas.(8)

STEPS/PROCEDURES IN FACING! CONFRONTING MORAL DILEMMAS

All the above said three problems pave the way for the need of several steps in resolving the moral dilemmas. All the steps are interrelated and they can also be used jointly.

(1) Identifying the relevant moral factors and reasons : i.e. Finding solutions for (i) the conflicting responsibilities (ii) the competing rights and (iii) the clashing ideals involved

(2) Collecting and gathering all the available facts which are relevant to the moral factors while resolving.

(3) Ranking the moral considerations or principles on the basis of importance as applicable to the situation. But sometimes it is not possible when the objective is to find a way to meet equally urgent responsibilities and to promote equally important ideals.

(4) Considering alternative courses of action for resolving the problems and tracing the full implications of each. i.e. conducting factual inquiries.

(5) Having talked with the colleagues, friends about that problem getting their suggestions and alternative ideas on resolving that dilemma and

(6) Arriving at a careful and reasonable judgement or solution by taking into consideration all important moral factors and reasons on the basis of the facts or truths. But it seems to be difficult.

To conclude, only the study of Engineering Ethics can help in developing the skills and attitudes to follow the above steps in resolving a moral problem among the engineers and other professionals by means of case studies, class, room discussions and debating.

3.Discuss the different models of professional roles.(8)

The main aim of the profession of engineering is to improve the public safety, wealth and welfare. In order to perform these functions, the engineer has to play various models to channalise his attitudes towards the achievement of objectives. They are as follows:

(1) Savior

The engineers are responsible for creating an utopian society in which everything is possible and can be achieved without much effort — This can only be achieved through technological developments made by the engineers, for safe-guarding the society from poverty, inefficiency, waste and manual labour.

(2) Guardian

Engineers only know the directions through which technology will be developed. So, they should be given position of high authority based on their expertise skills in determining what is in the best interests of the society. They should act as guardians to the technological improvements.

(3) **Bureaucratic Servant**

Engineers' role in the management is to be the servant who receives and translates the directive of management into better achievements. They have to solve the problems given by the management, within the limits set by the management.

(4) Social servant

The role of engineers is not only providing service to others but also their responsibility to the society. The interests of the society can be expressed to the engineers **it** either directly or indirectly. So, the engineers, with the co-operation of the management, have the work of receiving society's directives and satisfying the desires of the society.

(5) **Social enabler and catalyst**

The engineer has to play a role of creating a better society and should be the cause of making social changes. Service given by the engineers to the society includes carrying out the social directives . Engineers are needed to help the management and the society to understand their needs and to create decisions about technological development.

(6) Game Player

We cannot say that engineers are servants or masters of anyone. They are playing the economic game rules which may be effective at a given time. Their aim is to play successfully within the organization enjoying the happiness of technological work and the satisfaction of winning and moving ahead in a completive world.

4.Explain the three levels of moral developments with respect to Kohlberg and Gilligans views.

Moral Autonomy is based on the psychology of moral development. The first psychological theory was developed by Jean Piaget. On the basis of Piaget's theory, Lawrence kohlberg developed three main levels of moral development, which is based on the kinds of reasoning and motivation adopted by individuals with regard to moral questions.

1. The Preconventional Level

It is nothing but self-centered attitude. In this level, right conduct is very essential for an individual which directly benefits him. According to this level, individuals are motivated by their willingness to avoid punishment, or by their desire to satisfy their own needs or by the influence of the power exerted by them. This level is related to the moral development of children and some adults who never want to grow beyond a certain limit.

2. The **Conventional Level**

The level deals with the respect for conventional rules and authority. As per this level the rules and norms of one's family or group or society has been accepted as the final standard of morality. These conventions are regarded as correct, because they represent with authority. When individuals are under this level, they always want to please or satisfy others and also to meet the expectations of the society and not their self-interest. Loyalty and close identification with others have been given much importance. No adult tries to go beyond this level.

3. The Post Conventional Level

This level is said to be attained when an individual recognizes the right and the wrong on the basis of a set of principles which are not based on self-interest or social conventions. These individuals are called "autonomous**,** because they only think by themselves and also they do not agree that customs are always correct. They want to live by general principles which are universally applied to all people. They always want to maintain their moral integrity, self-respect and the respect for other autonomous people.

Kohlberg's theory of moral development is very much related to the goals of• studying ethics at college level. To become morally responsible, an individual must be able and willing to undergo moral reasoning. Moral responsibility comes out of the foundation of early moral training given by an individual's parents and culture. This early training helps to complete the above said three levels of moral development by an individual.

As per Kohlberg's view only few people would reach the post conventional level which is based on the assumption that movement towards autonomy is morally desirable.

Caorl Gilligan was one of the students of Kohlberg. She criticizes Kohlberg's theory on the *basis* of approaches made by both male and female towards morality. On the basis of her studies and researchs, she criticises Kohlberg's theory which is only based on male bias and his studies are of typically male preoccupation with general rules and rights.

She also suggests that men are always more interested in resolving moral dilemmas by applying some most important moral rules. But women always want to keep up the personal relationships with all those involved in a situation and they always give attention only on the circumstances responsible for that critical situation and not on general moral rules.

She also states that Kohlberg's theory is only an ethics of rules and rights. But her theory is known as ethics of care. i.e. context oriented emphasis required to maintain the personal relationship.

LEVELS OF MORAL DEVELOPMENT

Gilligan recasts Kohlberg's three levels of moral development on the basis of her own studies of women, as follows:

(i) **The Pre-conventional level**

This is more or less the same as Kohlberg's first level i.e. Right conduct is a selfish thing as solely what is good for oneself.

(ii) **The Conventional Level**

This level differs from Kohlberg's second level. According to her, women don't want to hurt others and want to help others i.e., women always want to give up their interests in order to help the others to fulfill their needs.

(iii) The Post Conventional level

This level is also differed from Kohlberg's level. In this level, individuals (particularly women) want to balance between caring about other people and their own interests. The main aim here is to balance an individual's needs with those of others on the basis of mutual caring. This can be achieved only through context-oriented reasoning and not by abstract rules.

'HEINZ'S DILEMMA'

Gilligan's criticism on the Kohlberg's theory can be made very clear with the help of a famous example used by Kohlberg in his questionnaires and interviews. This is called Heinz's Dilemma.

This example was about a woman and Heinz, her husband, living in Europe. The woman was affected by cancer. The doctors told her to use an expensive drug to save her life. The pharmacist who also invented that medicine charged ten times the cost of making the drug. In spite of his poverty, Heinz took a lot of effort to borrow money, but he could get only half of the amount needed. He approached to the pharmacist and begged him to sell the medicine at a cheaper price or allow him to pay for it later. But the pharmacist refused to do so. Finally without any hope, Heinz forcibly entered into the pharmacy and stole the drug. The question here is "Was the theft morally right or wrong?"

By asking this question among the males, Kohlberg has received two sets of answers: One is based on the conventional level i.e. Heinz did a wrong thing. Another one is based on the post conventional level i. e Heinz was correct as the life of the wife is more important than the property right of the pharmacist.

But when the same question was asked among the women, they gave (all women) same answer. They replied that Heinz was wrong. They further told that instead of stealing the medicine, Heinz could have tried alternative solutions. They also told that Heinz should have convinced the pharmacist to give the medicine.

From the above, Kohlberg concluded that women's decisions are always based on conventional rule and also they always have different opinions in applying the general moral rules and principles about the right to live.

On the basis of the Kohlberg's comment on the women, Gilligan came to a different conclusion. She tells that it shows greater sensitivity to people and personal relationships.

She concluded that the decision taken by women is context-oriented and not on the basis of general rules ranked inorder of priority.

Now, the question here is, how Gilligan's theory of moral development relates to moral autonomy as a goal of studying ethics at the college level?

Autonomy requires independent reasoning on the basis of moral concern and not separated from other people. As per Gilligan's theory and Kohlberg's theory, moral autonomy should be consistent with 'context-oriented' and also with an awareness general moral principles and rights.

5.Explain Professional and Professionalism

Engineering is a great profession which helps to realize anything and everything in the world. Engineering gives jobs and homes to people and also it improves the standard of living.

The important and great liability of engineers when compared to other professions is that the work of an engineer is open to all and all can see the works done by an engineer. He can not hide his mistakes as doctors do. He cannot argue like a lawyer. He can not blame others for his mistakes like the politicians. If his work is wrong; only he will be condemned by others.

In the modern world today, with the help of the mass communication and other facilities, the products of engineering are much "out in the open", than the ancient period. There are also more number of engineers. But, in spite of their large numbers, they are less visible to the public today. The invisibility of engineers makes it difficult for them to keep a sense of accountability and mutual understanding with the public. So the engineers must have some responsibility to do good to the public by their profession or as a professional.

DEFINITION

The word 'Professional' gets different meanings based on the context. In general 'Professional' relates to any work that a person does for an occupation, especially work which requires a special skill or training.

" Profession" means a type of job that requires special training and that brings a fairly high status, for example — work connected with medicine, law and education.

Whatever may be one's profession one should show one's professionalism, qualities that are typical or expected of a person in that profession.

Professionalism can be achieved through the following criteria:

1. Knowledge

The job! work must include complicated skills, theoretical knowledge a clear judgment and caution. Preparation of a person to do a job requires some formal education ,like technical studies as well as humanistic studies, etc.

2. ***Organization***

Some special societies or organizations must be formed for the profession .These societies and organizations must be accepted by the public to set the standards for that profession, writing code of ethics of that profession and also these organizations have to represent that profession to the public. For example societies like ISTE, IEEE etc.

3. Public Good

The Job / work must help the public by doing a favour to them quoted in its code of ethics. For example , medicine is for promoting health, law is for protecting the legal rights of the public and engineering towards improving the public's health, safety and welfare with the help of technological advancements.

To conclude, a job or a work or an occupation can be said to be a profession only when professionals have got all the above said criteria, Of late, only engineering, medicine, law, and business administration can be called professions. The sanitation work, driving, sports can not be called professions as they are lack the above said criteria.

MEMBERSHIP CRITERIA

The following criteria have been proposed in the United States for being an engineer or professional engineer.

(i) Getting a bachelor's degree in engineering at an Institutions approved by the Accreditation Board for Engineering and Technology. (like AICTE, NAAC etc. in India).

(ii) He / She *must* perform the work which should be based on his/her qualification are eligibility. [A person who has got an engineering degree but worked as a full-time manager and a person who performs the work done by engineers but not acquired degree in engineering are not eligible).

(iii) Besides degree, he/she should obtain license from a registered body or certificate from a professional Engineer-in-Training programmes and also have 4 to 5 years of experience in the field concerned.

(iv) Behaving in moral responsible ways, while performing the works of engineering. The standards and norms for responsible conduct has to be based on the specified codes of ethics. More over, in USA, only those engineers whose work directly affect the public safety and who are eligible to sign or. the documents such as drawing for buildings must be registered **as** Professional Engineers. Engineers who practice in manufacturing or teaching at engineering schools are exempted. Of course some acquire the professional engineer licenses because of their status or prestige.

PERSUASIVE DEFINITIONS

Persuasive definitions means giving definitions which are good at making the people agree with that meaning.

(I) Professional as Independence

Some persuasive definitions straightaway connect professionalism to independence and freedom from the use of force. Robert L. Whitelaw defines "professionalisms and employee status as logically incompatible" so long as the individual is looked upon as an employee rather than as a free artisan; to that extent there is no professional status.

Therefore, only consulting engineers are said to be the professionals. The other types of engineers, working as employees in business or governmental bureaucracies can be called professionals only when they are protected by an engineering bill of rights enjoyed already by consulting engineers. The rights are as follows: the rights to freedom from surveillance, psychological manipulation and other job evaluation techniques.

On the basis of the definition given by Robert L.Whitelaw, an engineer can not be a professional engineer if he works on the basis of his employer's orders which are concerning the public good. He further views that professional involves the freedom to act according to his / her own judgment about conduct i.e. free from excessive domination of engineers by the authority of management.

(ii) Professionalism as Serving Employers

This definition is entirely opposite to the above. This type of persuasive definition considered the loyal service exerted by the individuals / engineers to employers or clients as the main root cause of professionalism in engineering.

Another view by Samuel C. Florman, says, "it is very essential that each and every professional should serve their employers! clients and their everyday work should be filtered

through a sieve of ethical sensitivity. They have to meet the expectations of their clients and employers in a satisfactory manner. The restraint should be only the laws and govt. regulations rather than personal conscience".

Florman's essay is entirely different from the ethical codes of the Accreditation Board for Engineering and Technology and the Engineers Council for Professional Development. Their codes of ethics state that Engineers shall hold paramount the safety, health and welfare of the public in the performance of their professional duties . But Florman's response to that is "Engineers are obliged to bring integrity and competence to whatever work they undertake. But they should not be counted upon to consider paramount the welfare of the human race".

Many of the Engineers agree with the definition of Florman. But it is also subject to a criticism that this conception is narrow.

(iii) An intermediate position

This definition of persuasive nature of professionalism based on the obligation to be performed by engineers lying between the extremes represented by Whitelaw and Florman. As per this definition engineers have larger obligations to both employers and the public.

According to this view, professional engineer has to meet two criteria - **(1)** Achieving standards of achievement in education, job performance and creativity in engineer's field which differentiate engineers from engineering technicians and technologists.

(2) Accepting the most basic moral responsibilities of their professional obligations to ,rs the public and to their employers, clients, colleagues and subordinates.

MULTIPLE MOTIVES

The definition of professional engineers conveys that engineers are obliged to meet and fulfill their moral responsibilities. Their activities are followed by a line of conduct from *a* combination of Motives. Some of these motives belong to morality and some may not. There are a large number of motives for professionalism in engineering. Some important motives other than earning a living are discussed below.

The curriculum of undergraduate engineering is normally more severe and difficult than any other academic disciplines. In spite of its difficulty, the students are motivated to enter engineering primarily by a desire for interesting and challenging work. They want to

create concrete objects and systems. They are having more skill in mathematics than any other discipline of students, despite of the fact that they are having low tolerance for uncertainties which cannot be measured.

Now the question is What does make them to produce technological products? The answer is given by Samuel Florman, As per Florman's view, the reason being the deep-rooted and elemental satisfaction derived from producing that product. He also describes engineering as an attempt to obtain and apply an understanding of the world so as to fulfil human needs and desires.

The following are some of the 'existential pleasures' offered by engineering as per Florman and some other sources.

(1) The first pleasure is the personal involvement of changing the world - Because, human beings are always compelled to improve the world by their activities. There is no end for achieving improvements

(2) The second pleasure is the happiness involved in creative effort. This is the result of changing the world. This effort includes planning, designing, testing, producing, selling, constructing and maintaining. The engineers greatest happiness lies in his creativity in solving practical problems which is in contrast with the scientists, whose main interests are in discovering a new knowledge.

(3) The next pleasure is, like the scientist, in understanding the world by using the laws and riddles of the world. (4) The fourth pleasure is related specifically to the size in the world. Engineers' ideas are in producing large ships, long bridges, tunnels and others are based on the large natural facts such as ocean, rivers, mountains etc.

(5) T he fifth pleasure relates to the importance of machines i.e mechanical environment only can create a comfortable and absorbing sense of manageable. controlled and ordered world.

(6) The final pleasure is that of a strong sense of helping others. The main existential pleasure of the engineer, will always be to contribute to the well being of his follow men These multiple motives are usually compatible and mutually reinforcing, but occasionally they come into conflict in ways that can affect professional judgment.

MODELS OF PROFESSIONAL ROLES

The main aim of the profession of engineering is to improve the public safety, wealth and

welfare. In order to perform these functions, the engineer has to play various models to channalise his attitudes towards the achievement of objectives. They are as follows:

(1) Savior

The engineers are responsible for creating an utopian society in which everything is possible and can be achieved without much effort — This can only be achieved through technological developments made by the engineers, for safe-guarding the society from poverty, inefficiency, waste and manual labour.

(2) Guardian

Engineers only know the directions through which technology will be developed. So, they should be given position of high authority based on their expertise skills in determining what is in the best interests of the society. They should act as guardians to the technological improvements.

(3) **Bureaucratic Servant**

Engineers' role in the management is to be the servant who receives and translates the directive of management into better achievements. They have to solve the problems given by the management, within the limits set by the management.

(4) Social servant

The role of engineers is not only providing service to others but also their responsibility to the society. The interests of the society can be expressed to the engineers **it** either directly or indirectly. So, the engineers, with the co-operation of the management,
have the work of receiving society's directives and satisfying the desires of the society.

(5) **Social enabler and catalyst**

The engineer has to play a role of creating a better society and should be the cause of making social changes. Service given by the engineers to the society includes carrying out the social directives . Engineers are needed to help the management and the society to understand their needs and to create decisions about technological development.

(6) Game Player

We cannot say that engineers are servants or masters of anyone. They are playing the economic game rules which may be effective at a given time. Their aim is to play successfully within the organization enjoying the happiness of technological work and the satisfaction of winning and moving ahead in a completive world.

.

6.Explain Moral Dilemma?

Engineering Ethics is not only teaching moral behaviour in knowing about immoral and amoral in a set of beliefs, but also increasing the ability of engineers and other professionals to face boldly the moral problems arising from technological advancement changes and other related activities. This can be imparted among the engineers, only through college courses, seminars, etc. which involve individual study.

Dilemmas are certain kind of situations in which a difficult choice has to be made. Moral dilemmas can also be called moral problems. Moral Dilemmas have two or more foldings - moral obligations, duties, rights, goods, or ideals come disagreement with each other. One moral principle can have two or more conflicting applications for a particular given situation. Moral dilemmas can occur in so many ways For example, suppose one gives a promise to his friend that he will meet him on the evening of a particular day, but unfortunately on the same day his brother has met with an accident and he has to take him to hospital. The dilemma here consists of a conflict between the duty to keep the promise and the obligations to his brother. In this situation to solve this moral problem, he can make a phone call to his friend and make apology for his inability to come. So, from the above it is clear that the duty to keep promise - always has two different and conflicting applications.

The moral dilemmas cannot easily be addressed or resolved always. It requires an elaborate searching which sometimes causing extreme suffering and reflection of a situation The modem engineering practice compels that all the engineers have to face boldly the moral dilemmas in their careers.

To find a simple and clear solution to the moral problems in the field of engineering there must be some provision to allocate time for learning ethics in engineering

courses But at the same time, it should not be ignored in the following three categories of complete and gloomy moral situations.

(1) **The Problem of Vagueness**

The problem of vagueness is related to individuals. The individuals may not know how to use moral considerations or principles in resolving a moral problem at a particular situation. For example, an engineer in a higher position of a company, is responsible and having the sole right to make purchases on his own on behalf of the company. There may be many suppliers for supplying materials. In this situation, a sales representative from one of the suppliers approaches him with a gift. In this case, the engineer may have some doubts like (i) Whether this is an acceptance of a bribe? (ii) Does it create a conflict of interest? The solution is only with that engineer. He can also discuss with his colleagues about the problem. The colleague may find the solution on the basis of previous experiences, - it may not be a kind of a bribe, but at the same time it should not be encouraged in future because there is the possibility of supplying substandard materials. It is difficult to arrive at the conclusion whether the gift is an innocent amenity or an unacceptable bribe.

(ii) **The problems of Conflicting reasons**

These occur more frequently. In a difficult situation of a moral problem, an individual may clearly know about what moral principle has to be applied to resolve the problem. When it arises, there are two or more moral principles with clear solutions in conflict with one another or one particular moral principle. Simultaneously, there can be of two different directions. In this case, that individual has to choose a better one among them on the basis of the importance and the applicability. For example, an engineer has given a promise to his employer and another one to a colleague. If it is difficult to fulfill both the promises, he can drop off one promise which is of the least importance. If he explains the situation to his colleagues, it can be understood.

(iii) The problems of disagreement

The individuals and groups in engineering companies may disagree with resolving moral problems in difficult situations. The disagreement will be normally about how to interpret, apply and balance the moral problems. In this situation they have to use the following steps to resolve the problems.

STEPS/PROCEDURES IN FACING! CONFRONTING MORAL DILEMMAS

All the above said three problems pave the way for the need of several steps in resolving the moral dilemmas. All the steps are interrelated and they can also be used jointly.

(1) Identifying the relevant moral factors and reasons : i.e. Finding solutions for (i) the conflicting responsibilities (ii) the competing rights and (iii) the clashing ideals involved

(2) Collecting and gathering all the available facts which are relevant to the moral factors while resolving.

(3) Ranking the moral considerations or principles on the basis of importance as applicable to the situation. But sometimes it is not possible when the objective is to find a way to meet equally urgent responsibilities and to promote equally important ideals.

(4) Considering alternative courses of action for resolving the problems and tracing the full implications of each. i.e. conducting factual inquiries.

(5) Having talked with the colleagues, friends about that problem getting their suggestions and alternative ideas on resolving that dilemma and

(6) Arriving at a careful and reasonable judgement or solution by taking into consideration all important moral factors and reasons on the basis of the facts or truths. But it seems to be difficult.

To conclude, only the study of Engineering Ethics can help in developing the skills and attitudes to follow the above steps in resolving a moral problem among the engineers and other professionals by means of case studies, class, room discussions and debating.

7.Explain the types of inquiry?

Inquiry means an investigation. Like general ethics, Engineering ethics also involves investigations into values, meaning and facts. These inquiries in the field of Engineering ethics are of three types.

1. Normative Inquiries
2. Conceptual Inquiries
3; Factual or Descriptive Inquiries.

NORMATIVE INQUIRIES

These inquiries are mostly helpful to identify the values which guide the individuals and groups in taking a decision. These are meant for identifying and justifying some norms and standards of morally desirable nature for guiding individuals as well as groups. In most of the cases, the normative questions are: what should be? and what is good? Some normative types of questions are given below:

1. How does the obligations of engineers protect the public safety in given situations?
2. When should an engineer have to alarm their employers on dangerous practices? 3. What are the laws and organizational procedures that affect engineering practice on moral issues? 4, What are the moral rights essential for engineers to fulfill their professional obligations? From these questions, it is clear that normative inquiries also have the theoretical goal of justifying moral judgements.

CONCEPTUAL INQUIRIES

These are meant for describing the meaning of concepts, principles and issues related

to Engineering Ethics. These inquiries also explain whether the concepts and ideas are expressed by single word or by phrases The following are some of the questions of conceptual inquiries.

1. What is safety and how is it related to risk?
2. What does it mean when codes of ethics say engineers should protect the safety, health and welfare of the public?
3. What is a 'bribe'?
4. What is a 'profession' and professional'?

FACTUAL / DESCRIPTIVE INQUIRIES

These help to provide facts for understanding and finding solutions to value based issues. The engineer has to conduct factual inquiries by using scientific techniques. These help to provide information regarding the business realities such as engineering practice, history of engineering profession, the effectiveness of professional societies in imposing moral conduct, the procedures to be adopted when assessing risks and psychological profiles of engineers. The information about these facts provide understanding and background conditions which create moral problems. These facts are also helpful in solving moral problems by using alternative ways of solutions.

These types of inquiries are said to be complementary and interrelated. Suppose an engineer wants to tell a wrong thing in an engineering practice to his superiors, he has to make all these inquiries and prepare an analysis about the problem on the basis of moral values and issues attached to that wrong thing. Then only he can convince his superior. Otherwise his judgment may be neglected or rejected by his superior.

8.Explain moral Autonomy?

Autonomy means self— governing or self— determining i.e., acting independently. Moral autonomy means the right or the wrong conduct which is independent on ethical issues. It deals with the improvement of an individual's moral thoughts which make him to adapt good habits. Moral Autonomy is concerned with the independent attitude of a person related to ethical issues. It helps to improve the self- determination among the individuals.

THE NEED FOR MORAL AUTONOMY IN THE FIELD OF ENGINEERING ETHICS

The objectives of Engineering Ethics are not related to implanting particular moral beliefs on engineers. In other way they help the engineers and other professionalists to strengthen their professional values such as honesty, respect for the colleagues and thinking for the welfare of the general public. Though the above said values have been already in the minds of the engineers, engineering ethics helps to improve these qualities in a better manner among the engineers, and not inculcating them newly. The structural objective of engineering ethics is to enable the individuals to understand the moral responsibilities in a clear and careful manner. So, the main aim of studying engineering ethics is to increase the moral autonomy within him.

Moral Autonomy is a skill and habit of thinking ethical problems in a rational manner. These ethical issues are to be found out on the basis of moral problems. General responsiveness of moral values are derived only from the training that we have received as a child with response to the right of others and ourselves. Suppose the training is not given in the childhood itself, those children may be ill-treated or neglected by the society. These

children in future may grow up with lack of sense on moral issues and they become sociopaths. They are never morally autonomous. They won't regret their mistakes and wrong doings.

These moral concerns can be initiated or imparted among the engineers, mainly by engineers of various subjects and also by the way of their friends, or by social events occurring around them or by books and movies. So the main aim of all the courses of Applied Ethics is only to improve their abilities in order to face the moral issues critically. This can only be achieved by improving the practical skills which are helping in producing effective independent or self— determination thoughts among the individuals about the moral problems.

SKILLS FOR IMPROVING MORAL AUTONOMY

1. The engineers must have the competence for identifying the moral problems and ethical issues related to the field of engineering -- they must have the ability to distinguish and relate these moral problems with the problems of law, economics, religions principles etc.

2. They must possess the skills of understanding, clarifying and assessing the arguments which are against the moral issues.

3. They must have the ability to suggest the solutions to moral issues , on the basis of facts. These suggestions must be consistent and must include all the aspects of the problem.

4. They must have the imaginative skill to view the problems from all view points and also be able to suggest proper alternative solutions.

5. They must be able to tolerate while giving moral judgments and decisions which may cause trouble .i.e they have to understand the difficulties in making moral decisions.

6. They must have adequate knowledge and understanding of the use of ethical language so as to defend or support their views with others.

7. They must have some better knowledge in understanding the importance of suggestions and better solutions while resolving moral problems and also about the importance of tolerance on some critical situations.

8. They must understand the importance of maintaining the moral honesty i.e. the personal convictions and beliefs and individual's professional life must be integrated. They must have this skill of doing so.

9.Write short notes on Consensus and Controversy? (8)

Consensus means 'agreement' and 'controversy' means disagreement. The consensus and the controversies are playing the vital roles while considering the moral autonomy.

When an individual exercises the moral autonomy, he cannot get the same resu1ts as others get in applying moral autonomy. Surely there must be some moral differences i.e. the results or verdicts will be of controversy. This kind of disagreements is unavoidable, These disagreements require some tolerance among individuals who are autonomous, reasonable and responsible.

As per the principle of tolerance, the goal of teaching engineering ethics is not merely producing an agreed conformity on applying moral principles among engineers but also to reveal the ways of promoting tolerance to apply moral autonomy.

Both the goals of engineering ethics and the goals of engineering courses have some similarities. These similarities have to be extended with the help of exercising authority.:

For example, in the class room, the teachers are having the authority over students and in the work place, the managers are having the authority over engineers.

There are two general points regarding the relationship between ***autonomy*** and *authority* with reference to the class room:

(1) Moral autonomy and respect for the authority cannot be differentiated or separated. from each other. Moral autonomy is exercised on the basis of moral concern for other people and also recognition of good moral reasons. Authority provides for the framework in which learning can take place. It is based on the acceptance of authority by both the

students and the professors. Without this acceptance, the classes cannot be conducted in a smooth way. On the other hand, cheating will be encouraged and the trust between faculty and the students may be reduced to some extent. These kind of deviations are due to the absence of moral views and respect for authority. They must be coincide with each other.

(2) Generally a tension may arise among the individuals regarding the need for consensus about authority and need for autonomy. This tension can be reduced by students and faculty discussing openly regarding a moral issue with the help of the authority.

In short, conflicts will arise between autonomy and authority, when the authority is misused. For example, in small classes, the students are having the authority to express their own views. But when the professor doesn't allow them to do so, he misuses his authority. This will create some moral problems between the students and the faculty.

10.Write short notes on Variety of moral issues? (8)

There are so many engineering disasters which are greater! heavier than the level of acceptable or tolerable risk. Therefore, finding and avoiding such cases such as nuclear plant accident at Chemobyl (Russia), Chemical plant accident at Bhopal (India) where a big disaster of gas leakage, occurred in 1980, is necessary. In the same way, oil spills from some oil extraction plants (the Exxon Valdez plant), hazardous waste, pollution, natural disasters like floods, earth quake and danger from using asbestos and plastics are some more cases of engineering disasters. These fields should be given awareness of engineering ethics. Hence, it is essential for engineers to get awareness on the above said disasters. They should also know the importance of the system of engineering.

When malfunction of the system is a rapid one, the disaster will be in greater extent and can be noticed immediately. When they are slow and unobserved, the impact is delayed. So, the engineers should not ignore the functions of these systems.

These cases also explain and make the engineers to be familiar with the outline of case in future and also about their related ethical issues.

APPROACHES TO ENGINEERING ETHICS

(1) MICRO-ETHICS: This approach stresses more on some typical and everyday problems which play an important role in the field of engineering and in the profession of an engineer.

(ii) **MACRO-ETHICS:** This approach deals with all the societal problems which are unknown and suddenly burst out on a regional or national level.

So, it is necessary for an engineer to pay attention to both the approaches by having a careful study of how they affect them professionally and personally. The engineers have to acquaint themselves with the everyday problems both from personal and societal point of view.

Some cases with which different areas are covered by engineering ethics. :

1. An inspector finds a faulty part in the manufacture of a machine, which prevents the use of that machine for a longer period. But his superior, takes this as a minor mistake and orders that the faulty part be adjusted so that the delay in the process can be avoided. But the inspector doesn't want this and so he is threatened by the supervisor.

2. An electronic company applies for a permit to start a Nuclear Power Plant. When the licensing authority comes for visit, they enquire the company authorities on the emergency measures that have been established for safety of the surroundings. The engineers inform them about the alarm system and arrangements that have been made in local hospitals for the treatment of their employee's they have no plan for the 4 surrounding people. They also inform that it is the responsibility of the people.

3 A Yam Dyeing company dumps its wastes in the nearby river. It causes heavy damage g to the people who are using the river. The plant engineers are aware of this, but they do not change the disposal method because their competitors are also doing similarly 1 as it happens to be cheaper. They also say that it is the responsibility of the local government.

UNIT-II

ENGINEERING AS SOCIAL EXPERIMENTATION

1.What are the main aspects that are virtual for combining engineering works to make it suitable as experiments?(8)

There are so many aspects which are of virtual importance for combining every type of engineering works to make it suitable to look at engineering projects as experiments. The main three important aspects are:

- Any project is carried out in partial ignorance due to
  - The uncertainties in the abstract model used for the design calculations,
  - The uncertainties in the precise characteristics of the materials purchased,
  - The uncertainties caused by variations in processing and fabrication of materials and
  - The uncertainties about the nature of stresses the finished product will encounter.

Indeed, Engineer's success lies in the *ability to accomplish tasks* with only a *partial knowledge* of scientific laws about nature and society.

- The final outcome of engineering projects, like those of experiments, is generally uncertain. Very often, possible outcomes are not even known and great risks may be presented which could never be thought of.

  The following uncertainities occur in the model designs

  - Model used for the design calculations.
  - Exact characteristics of the material purchased.
  - Constancies of materials used for processing and fabrication.
  - About the nature of the pressure the finished product will encounter.

- Good and effective engineering depend upon the knowledge possessed about the products at the initial and end stages.

  Effective Engineering relies upon knowledge gained about products both before and

after they leave the factory- knowledge needed for improving current products and creating better ones. That is, ongoing success in engineering depends upon gaining new knowledge.

2.What are the aspects in which engineering differs from standard experiments?(8)

Engineering is entirely different from standard experiments in few aspects. These differences are very much helpful to find out the special responsibilities of engineers and also help them in knowing about the moral irresponsibilities which are involved in Engineering

1. EXPERIMENTAL CONTROL: In standard experiments, members are in two different groups. Members of one group receive special experimental treatment. The other group members, called 'control group' do not receive special treatment, though they are from the same environment in all other respects.

But this is not true in engineering, since most of the experiments are not conducted in laboratories. The subjects of experiments are human beings who are outside the experimenter's control.

Thus it is not possible to study the effects of changes in variable on different groups. Hence only historical and retrospective data available about various target groups has to be used for evaluation. Hence engineering as a social experimentation seems to be an extended usage of the concept of experimentation.

2. INFORMED CONSENT:

It has two elements, knowledge and voluntariness. The subjects (human beings) should be given all the information needed to make a reasonable decision. Next, they must get into the experiment without being subjected to force, fraud or deception. Supplying complete information is neither necessary nor in most cases possible. But all relevant information needed for making a reasonable decision on whether to participate should be conveyed. Generally, we all prefer to be the subject of our own experiments rather than those of somebody else.

Conditions defining *Informed or Valid Consent*

- The consent is given voluntarily
- The consent is based on information a rational person would want, together with any other information requested and presented to them in understandable form.
- The consenter was competent to process the information and make rational decisions.
- Information has been widely disseminated.
- The subject's consent is offered by proxy by a group that collectively represents many subjects like interests, concerns and exposure to risk.

KNOWLEDGE GAINED

Scientific experiments have been conducted to acquire new knowledge.
Whereas engineering projects are conducted as experiments not for getting new knowledge. Suppose the outcome of the experiment is best it tells us nothing new but affirms that we are right about something Mean while the unexpected outcomes put us on search for new knowledge.

3.What are the conditions that are essential for a valid Informed Consent?(8)

- The consent is given voluntarily
- The consent is based on information a rational person would want, together with any other information requested and presented to them in understandable form.
- The consenter was competent to process the information and make rational decisions.
- Information has been widely disseminated.
- The subject's consent is offered by proxy by a group that collectively represents many subjects like interests, concerns and exposure to risk.

4.What are the different roles and functions of "CODES"?

The codes of ethics have to be adopted by engineering societies as well as by engineers. These codes exhibit the rights, duties and obligations of the members of a profession. Codes are the set of laws and standards.

A code of ethics provides a framework for ethical judgement for a professional. A code cannot be said as totally comprehensive and cover all ethical situations that an engineer has to face. It serves only as a starting point for ethical decision making.A code expresses the circumstances to ethical conduct shared by the members of a profession.It is also be noted that ethical codes donot establish the new ethical principles.They repeat only the principles and standards that are already accepted as responsible engineering practice.A code defines the roles and responsibilities of professionals.

CODES OF ETHICS - *ROLES OR FUNCTIONS*

- **Inspiration and Guidance:**
- Codes provide positive stimulus for ethical conduct and helpful guidance by using positive language.
- Codes should be brief to be effective and hence such codes offer only general guidance.
- Supplementary statements or guidelines to give specific directions are added by a number of societies or professional bodies.

2**. Support:**

- Codes give positive support to those seeking to act ethically.
- An engineer under pressure to act unethically can use one of the publicly proclaimed codes to get support for his stand on specific moral issues.

- Codes also serve as legal support for engineers.

3. Deterrence and discipline:

- Codes can be used as a basis for conducting investigations on unethical conduct.
- They also provide a deterrent for engineers to act immorally.
- Engineers who are punished by professional societies for proven unethical behaviour by revoking the rights to practice as engineers are also subjected to public ridicule and loss of respect from colleagues and local community.
- This helps to produce ethical conduct even though this can be viewed as a negative way of motivation.

4. Education and mutual understanding:

The codes can be used for discussion and reflection on moral issues and thereby improve the understanding of moral responsibilities among all engineers, clients, public and good organizations.

5. Contributing to the profession's public image:

Codes present the engineering profession as an ethically committed society in the eyes of the public thus enhancing their image.

6. Protecting status quo:

Codes establish ethical conventions, which can help promote an agreed upon minimum level of ethical conduct.

7. Promoting business interests:

Codes can place unwarranted restraints of commerce on business dealings..codes help to improve the business interests.

***Limitations* of Codes of Ethics**

- Codes are restricted to general and vague wording. They cannot be straightaway applied to all situations. It is impossible to foresee the full range of moral problems that can arise in a complex profession like engg
- They cannot serve as the final moral authority for professional conduct..
- Engineering codes often have internal conflicts.
- Only a few practicing engineers are the members of Professional societies and so they cannot be compelled to abide by their codes.
- Many engineers who are the members of professional societies are not aware of the existence of codes of their societies and they never go through it.
- Codes can be reproduced in a very rapid manner.
- Codes are said to be coercive.

5.Explain with sample example the purpose of Industrial Standards?(8)

Standards make the interchange of components. And serves as readymade substitute for lengthy design. Specification are also reducing the production costs. when the standards have been followed carefully, the quality will be attained in a very easy way. Examples of standards may range from automobiles tire sizes and load rating to computer languages.

Type of standards:

1.Quality

Moderate value

Eg: types and grains in wood working life of the product

1. Quality related to service

   Capability in achieving the target
   Eg: Accreditation procedures for institution.
2. Safety

   To safeguard from injury and thereby to reduce income loss and property damage
   Eg: Methods of handling waste disposal,
3. Acceptance in procedures for usage

   Flexibility communications and reliable design
   Eg:Procedures for testing and designing the symbols
   5.Physical properties and functions
   Interchangeability and conventional handling procedure measurement accuracy
   Eg: Standards in length, time and weights.

Standards are created by the companies for their internal use and by the professional associations for industry in wide use. They can also be prepared as part of laws and official regulations.

Standards help both the manufactures and the client/public. They help to keep competitiveness in industry and give channels to the smaller producers to compete with the larger ones. They secure a measure of quality and generate realistic trade off decisions.

In past standards were mostly descriptive. Now they move to performance standards are most essential for application.

6.Explain Research Ethics?

POLICY STATEMENT

The sovereignty of the community to make decisions about research in the community is recognized and respected. The researchers should maximize the benefits to the community as a whole and to individual community volunteers. Research should empower the community to support community goals of health and wellness, to improve its conditions and to fulfill its traditional responsibility of caring for the generations to come.

PRINCIPLES:

1. The community must be involved as a full partner in all aspects of the research. Continuous consultation and collaboration should characterize the partnership.
2. The strengths and culture of the community, including community researchers and staff as well as material resources, must be respected and utilized whenever possible.
3. Written permission must be obtained from the partners before beginning the research projects.
4. Permission from all individuals participating must be obtained prior to collecting personal information.
5. The confidentiality of all individuals must be respected. If necessary, the community involved may choose to remain anonymous when reporting the results.
6. All research results, analyses and interpretations must first be reviewed by the partners to ensure accuracy and avoid misunderstanding.
7. All data collected belongs to the community and must be returned to the community.
8. The partners must all be involved in making decisions about the publication and the distribution of all or parts of the research results.
9. The community must agree to the release of information.

OBLIGATIONS OF THE RESEARCHERS:

1. To do no harm to the community.
2. To involve the community in active participation rather than passive acceptance.
3. To ensure the design, implementation, analysis, interpretation, reporting, publication and distribution of the research are culturally relevant to the community and in agreement with the standards of competent research.
4. To undertake research that will contribute something of value to the community in which the research is being conducted.
5. To impart new skills to community members.
6. To help to address any issues that are raised as a result of research.

7. To provide expertise to scientifically answer questions that emerge from the community.
8. To promote academic diffusion of knowledge through written publications and oral presentations. This includes the documentation of the undertaking of the project and of the results.
9. To be guardians of the data until the end of the project and to return that data to the community at the end of the project.
10. To be involved in any future analysis of the data after the data has been returned to the community.

OBLIGATIONS OF THE COMMUNITY RESEARCHERS:

Community researchers are regarded as the Project Staff and those Co-investigators who are employed within the community. In addition to the obligations listed for researchers, the community researcher is obligated:

1. To maintain a long-term relationship of trust in the dual role of caregiver, educator, and researcher: this will only be possible if the needs of the community are always considered as the first priority in any decision.
2. To communicate with researchers during all phases of the research.
3. To arrange for researchers to meet with the partner Committees and/or Board of Directors, and any other local organizations to implement and promote the project.
4. To facilitate supervisory meetings of the Intervention and Evaluation teams.
5. To participate in all phases of the project, review all research results, analyses and interpretations for accuracy and present information to the community.

AUTHORSHIP GUIDELINES

The purpose of the project is to investigate the research questions described in the protocol. Since this project is unique, the results will be of interest to many other communities. For this reason it is necessary to share the experience of the project with the largest audience who might benefit from it. Part of the research process includes the communication of research results to other people and organizations in similar areas of research.

AUDIENCE

Communications will be directed at four general audiences:

1. Health, Education and other officials
2. Scientists and Researchers
3. The Community Council or governing body
4. The community, at large.

Health, education and other officials are those people providing services or working on programming and planning. They will be interested in how the project was developed and implemented as well as the outcome of project efforts. Scientists and researchers will be interested in the methods used, the process of the program, the impacts measured, and the answers provided to the research questions. The community at large is everyone who participated in the project as well as those who are generally interested in the project goals.

PRINCIPLES

All aspects of the project can be considered as worthy of communication. All communication pertaining to the project will follow generally accepted ethical standards.

The principles include:

1. Anonymity: Results to be presented in a grouped, not individual manner.
2. Confidentiality: All personal information provided by individuals will be made anonymous whenever possible and remain confidential unless otherwise determined by the individuals.
3. Priority of Communities Involved: The communities participating will be the first to review and receive results and the first invited to provide input and feedback on the results.
4. Respect: Consideration for the communities and all participants must be observed in all communications.

PROCESS

Results from research projects usually are presented in the following ways:

1. Articles in scientific journals, referred to as "a paper".
2. Oral presentation of "a paper" at a scientific conference or meeting.
3. Oral presentation to the community at large.
4. Written document to the community at large.
5. Teaching examples.

For scientific journals and oral presentations at scientific conferences and meetings there is a standard process involved. It is therefore possible to outline the steps from idea to final communication and outline the responsibilities for those involved with the authorship. However, these points should also apply to communications to the community. From here on the word communication will be used to describe both oral presentations and written papers.

It will be the responsibility of the project partners to ensure that the staff and investigators who have made significant contribution to the project can qualify for authorship. These are people who have worked directly on the project. However, being involved only in data collection or delivery of a program will not be sufficient for authorship.

1. The Idea:
   All ideas for communications must be presented to the partners before writing begins.
2. Preparing the Communication:
   The first author of an article (i.e. the person whose name appears first on the article) will assume the major responsibility for preparing the article. The first author will assume most of the writing responsibility. Other authors contributing to the communication will appear in descending order. This order will depend on the contribution made to the subject of the communication and the preparation and writing of the communication, including hunters and elders, in the body of the document and the author's section.
3. Submitting a Communication:
   All authors on the paper must approve of the final version before the paper is submitted to the journal, conference, etc. Furthermore, final versions of all papers must be approved by the partners before submission.
4. Peer Review:
   Communications may be reviewed by scientific and community people considered knowledgeable in the subject of the communication. This peer review process may

result in suggested changes of the communication in order for publishing the article in the journal of interest. All the authors of the communication must approve any changes made in the review. This will be done by a letter to the editor signed by all the authors.

This next section deals with special communications

5. Abstracts:
   An abstract is a short summary of the content of a communication. When someone wants to present a paper at a conference, an abstract will be sent to the conference organizers. The abstract will then be used to decide if the communication will be accepted for presentation. In case of a late call for an abstract, the partners should be contacted as soon as possible. If there are no objections, the abstract should be sent immediately. The preparation of the communication will proceed following the steps outlined previously.
6. Responsibility of Communication by the Partners:
   It is part of the shared responsibility of the partners to prepare communications for the community and the scientific community. Those who have more of an interest in them would appropriately prepare communications for the community: likewise for communication to the scientific communication. This should not limit the authors to one or the other.

EVALUATION GUIDELINES:

CODIFICATION, DATA ENTRY AND DATA CLEANING

1. The activities organized by the project should ensure that the data collection process is in accord with the host community values and norms, and competent scientific practice.
2. Participation in the evaluation activities is voluntary for the people in both communities. The people who express the desire to withdraw will be able to do so at any time.
3. All information or data collected on individuals will be kept strictly confidential. An identification number will be given and the names of participants will be removed. A file containing names and identification numbers will be kept for future follow-up. Only the Project Coordinator will have access to this file.
4. For reasons of confidentiality, the person responsible for coding the collected information should not have access to the names of the participants. The names of the participants should be removed prior to data coding.
5. The coordinator is responsible for the quality control of the data coding and entry.

PROCESS FOR APPLICATION TO RESEARCH IN CONJUNCTION WITH THE PROJECT:

The researcher and community need to meet for the purpose of discussion and approval of the research idea and the protocol involved. To meet this end, the following steps will be followed to make application:

- A letter is sent to one of the partners to request a meeting to discuss the research proposal. This letter is to include a summary description of the proposed research, a time frame for research, reporting, and the expected conclusion.
- The recipient of the request is responsible to: distribute the material to the other partners within one working week of receipt of the letter, establish a meeting with the

partners and the researcher, and send a copy of the Code of Research Ethics to the applicant to allow for preparation.

- If there are no objections from any of the members of the partners to the research proposal, formal written consent is to be sent within thirty (30) days of the meeting.
- In the event of any objections, a second meeting with the proposed researcher is to be held within two working weeks for discussion on the objection.
- The researcher must agree to comply with all aspects of the project Code of Research Ethics. The proposal will be rejected if the researcher refuses to comply with any aspect.
- All partners will review and discuss the completed research document(s) before publication. This review is to take place thirty (30) days following receipt of the research document(s).
- If there is any dissent, the dissenter is responsible to write and present a written response at this meeting. The dissent is to be included with the submission of the research document(s)

7.What does the Balanced Outlook on Law stress in directing engineering practice?

The 'balanced outlook on law' in engineering practice stresses the necessity of laws and regulations and also their limitations in directing and controlling the engineering practice. Laws are necessary because, people are not fully responsible by themselves and because of the competitive nature of the free enterprise, which does not encourage moral initiatives. Laws are needed to provide a minimum level of compliance .The following codes are typical examples of how they were enforced in the past.

Code for Builders by Hammurabi

Hummurabi the king of Babylon in 1758 framed the following code for the builders:"If a builder has built a house for a man and has not made his work sound and the house which he has built has fallen down and caused the death of the householder, that builder shall be put to death. If it causes the death of the householder's son, they shall put that builder's son to death. If it causes the death of the householder's slave, he shall give slave for slave to the householder. If it destroys property, he shall replace anything it has destroyed; and because he has not made the house sound which he has built and it has fallen down, he shall rebuild the house which has fallen down from his own property .If a builder has built a house for a man and does not make his work perfect and the wall bulges, that builder shall put that wall in sound condition at his own cost" This code was expected to put in self-regulation seriously in those years.

Steam Boat Code in USA

Whenever there is crisis we claim that there ought to be law to control this. Whenever there is a fire accident in a factory or fire cracker's store house or boat capsize we make this claim, and soon forget. Laws are meant to be interpreted for minimal compliance. On the other hand, laws when amended or updated continuously, would be counter productive. Laws will always lag behind the technological development. The regulatory or inspection agencies such as Environmental authority of India can playa major role by framing rules and enforcing compliance. In the early 19th century, a law was passed in USA to provide for inspection
of the safety of boilers and engines in ships. It was amended many times and now the standards formulated by the American Society of Mechanical Engineers are followed.

Industrial Standards

Standards make the interchange of components. and serves as readymade substitute for lengthy design. Specification are also reducing the production costs. when the standards have been followed carefully ,the quality will be attained in a very easy way. Examples of standards may range from automobiles tire sizes and load rating to computer languages.

Type of standards:

1.Quality

Moderate value

Eg: types and grains in wood working life of the product

- Quality related to service

Capability in achieving the target
Eg: Accreditation procedures for institution.

- Safety

To safeguard from injury and thereby to reduce income loss and property damage
Eg: Methods of handling waste disposal,

- Acceptance in procedures for usage

Flexibility communications and reliable design
Eg:Procedures for testing and designing the symbols
5.Physical properties and functions
Interchangeability and conventional handling procedure measurement accuracy
Eg: Standards in length, time and weights.

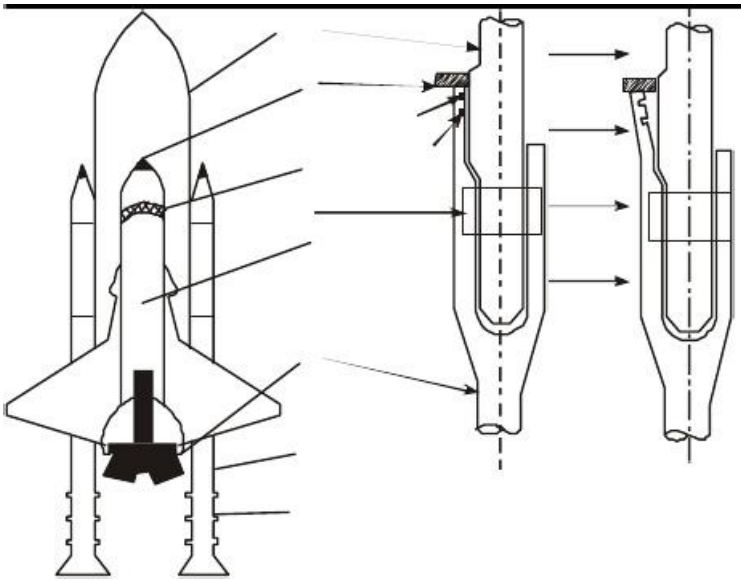
Standards are created by the companies for their internal use and by the professional associations for industry in wide use. They can also be prepared as part of laws and official regulations.

Standards help both the manufactures and the client/public. They help to keep competitiveness in industry and give channels to the smaller producers to compete with the larger ones. They secure a measure of quality and generate realistic trade off decisions.

In past standards were mostly descriptive. Now they move to performance standards are most essential for application.

8.How would you classify the space shuttle Challenger case study accident?why?

The orbiter of the Challenger had three main engines fuelled by liquid hydrogen. The fuel was carried in an external fuel tank which was jettisoned when empty. During lift-off, the main engines fire for about nine minutes, although initially the thrust was provided by the two booster rockets. These booster rockets are of the solid fuel type, each burning a million pound load of aluminum, potassium chloride, and iron oxide The casing of each booster rocket is about 150 feet long and 12 feet in diameter. This consists of cylindrical segments that are assembled at the launch site. There are four-field joints and they use seals consisting of pairs of O-rings made of vulcanized rubber. The O-rings work with a putty barrier made of zinc chromate. The engineers were employed with Rockwell International (manufacturers for the orbiter and main rocket),Morton-Thiokol(maker of booster rockets), and they worked for NASA. After many postponements, the launch of Challenger was set for morning of Jan 28, 1986.Allan J. McDonald Was an engineer from Morton-Thiokol and the director of the Solid Rocket Booster Project. He was skeptic about the freezing temperature conditions forecast for that morning, which was lower than the previous launch conditions. A teleconference between NASA engineers and MT engineers was arranged byAllan. Arnold Thompsonand Roger Boisjoly, the seal experts at MT explained to the other engineers how the booster rocket walls would bulge upon launch and combustion gases can blow past the O-rings of the field joints



On many of the previous flights the rings have been found to have charred and eroded. In freezing temperature, the rings and the putty packing are less pliable. From the past data gathered, at temperature less than 65°F the O-rings failure was certain. But these data were not deliberated at that conference as the launch time was fast approaching. The engineering managers Bob Lundand Joe Kilminster agreed that there was a safety problem. Boisjoly testified and recommended that no launch should be attempted with temperature less than53°F. These managers were annoyed to postpone the launch yet again. The top management of MT wasplanning for the renewal of contract with NASA, for making booster rocket. The managers told BobLund "to take-off the engineering hat and put on your management hat". The judgment of the engineers was not given weightage. The inability of these engineers to substantiate that the launch would be unsafe was taken by NASA as an approval by Rockwell to launch. At 11.38 a.m. the rockets along with Challenger rose up the sky. The cameras recorded smoke coming out of one of the filed joints on the right booster rocket. Soon there was a flame that hit the external fuel tank. At 76 seconds into the flight, the Challenger at a height of 10 miles was totally engulfed in a fireball. The crew cabin fell into the ocean killing all the seven aboard. Some of the factual issues, conceptual issues and moral/normative issues in the space shuttle challenger incident, are highlighted hereunder for further study.

9.What are the responsibilities of engineers for serving the society responsible experimenters?

The engineers have so many responsibilities for serving the society.

- A primary duty is to protect the safety of human beings and respect their right of consent.
- A comprehensive perspective of relevant information.
- Unrestricted free personal involvement in all steps of a project.
- Being accountable for the results of a project.
- Exhibiting technical competence and other characteristics of professionalism.

CONSCIENTIOUSNESS:

- Conscientious moral commitment means sensitivity to the full range of relevant moral values.
- Sensitivity to responsibilities that is relevant.
- Willingness to develop the skill and expend the effort needed to reach the best balance possible among these considerations.
- Conscientiousness means consciousness because mere intent is not sufficient.

Conceiving engineering as social experimentation restores the vision of engineers as guardians of the public interest in that they are duty bound to guard the welfare and safety of those affected by engg projects.

RELEVANT INFORMATION:

Conscientiousness is blind without relevant factual information. Moral concern involves a commitment to obtain and assess all available pertinent information. Another dimension to factual information is the consequences of what one does. While regarding engg as social experimentation points out the importance of context, it also urges the engineer to view his or her specialized activities in a project as part of a larger whole having a social impact that may involve a variety of unintended effects.It can be explained as:

1. To understand and grasp the circumstance of a persons work. It is necessary to know how that work has a moral importance.

2. Blurring the circumstance of a persons work derived from his specialization and division of labour is to put the responsibilities on some one else in the organization.

The above said means neglecting the importance of persons work also makes acquiring a full perspective difficult along with a second feature of factual information.

So giving regard to engineering as social experimentation, points out the importance of circumstances of a work and also encourage the engineers to view his specialized activities in a project as a part of a large social impact.

MORAL AUTONOMY

- People are morally autonomous when their moral conduct and principles of action are their own.
- Moral beliefs and attitudes must be a critical reflection and not a passive adoption of the particular conventions of one's society, religion or profession.
- Moral beliefs and attitudes cannot be agreed to formally and adhered to merely verbally.
- They must be integrated into the core of one's personality and should lead to committed action.
- It is wrong to think that as an employee when one performs '*acts'* serving company's interests, one is no longer morally and personally identified with one's actions.
- Viewing engg as a social experimentation helps to overcome this flawed thought and restores a sense of autonomous participation in one's work.
    - As an experimenter, an engineer is exercising the specialized training that forms the core of one's identity as a professional.
    - A social experiment that can result in unknown consequences should help inspire a critical and questioning attitude about the adequacy of current economic and safety standards.
    - In turn, this leads to better personal involvement with work.

ACCOUNTABILITY:

- Responsible people accept moral responsibility for their actions.
- Accountability is the willingness to submit one's actions to moral scrutiny and be open and responsive to the assessment of others.
- It should be understood as being culpable and blameworthy for misdeeds.

Submission to an employer's authority creates in many people a narrow sense of accountability for the consequences of their action. This is because of

i) Only a small contribution is made by one individual, when large scale engineering work is fragmented. The final product which is far away from one's immediate workplace, does not give a proper understanding of the consequences of one's action.

ii) Due to the fragmentation of work, a vast diffusion of accountability takes place. The area of personal accountability is delimited to the portion of work being carried out by one.

iii) The pressure to move on to another new project does not allow one to complete the observations long enough. This makes people accountable only for meeting schedules and not for the consequences of action.

iv) To avoid getting into legal issues, engineers tend to concentrate more on legal liabilities than the containment of the potential risks involved in their area of work.

10.What are the factors which may impede the flow of information for repeated mistakes in design?Explain with case studies?(8)

Engineers should learn not only from their own earlier design and operating results, but also from other engineers.

Engineers repeat the past mistakes of others due to the following reasons.

- Lack of established channels of communication.
- Misplaced pride in not asking for information
- Embarrassment at failure or fear of litigation.
- Negligence.

Examples:

1. The *Titanic* lacked sufficient number of life boats resulting in the death of 1522 out of 2227 (life boat capacity available was only 825), a few decades later *Arctic* perished due to the same problem.

2. In June 1966, a section of the Milford Haven Bridge in Wales collapsed during construction. A bridge of similar design, erected by the same bridge-builder in Melbourne, Australia, also partially collapsed in the month of October, same year. During this incident 33 people were killed and many were injured.

3. Malfunctions occurred at nuclear reactors at various locations and the information reports were with Babcock and Wilcox, the reactor manufacturer. In spite of these, no attention was paid leading to a pressure relief valve giving rise to the Three Mile Island nuclear accident on March 28, 1979.

11.Discuss the various problems being faced by the engineering and general public by Law in Engineering?(8)

There are so many number of legal regulations that are applicable to engineering and other professions.Even then there are so many complaints on the functioning of engineers and other professionals.

The important moral problem in engineering is minimal compliance.T his minimal compliance leads the companies and individuals to search for loop holes in the law when something goes wrong. They are not giving due respect to the law.Some engineers always refer to standards with readymade specifications as a substitution for original thought. Thus repetition of mistakes occurs.

A remedial measure may be taken by continually updating laws and regulations pertaining to engineering with further specifications. But this may also give worst effect.

The public is also cheeted by implementation of new laws for their security. Many laws are without enforceable sanctions. They serves as window dressing a false display of caring for the public.

Proper Role of Laws

Good laws when enforced effectively produce benefits. They establish minimal standards of professional conduct and provide a motivation to people. Further they serve as moral support and defense for the people who are willing to act ethically. Thus, it is concluded that:

1.The rules which govern engineering practice should be construed as of

responsible experimentation rather than rules of a game. This makes the engineer responsible for the safe conduct of the experiment.

2.Precise rules and sanctions are suitable in case of ethical misconduct that involves the violation of established engineering procedures, which are aimed at the safety and the welfare of the public.

3.In situations where the experimentation is large and time consuming, the rules must not try to cover all possible outcomes, and they should not compel the engineers to follow rigid courses of action.

4.The regulation should be broad, but make engineers accountable for their decisions,

5.Through their professional societies, the engineers can facilitate framing the rules, and enforce them, but without giving-in for conflicts of interest.

UNIT III

ENGINEER'S RESPONSIBILITY FOR SAFETY

1.Safety should be an integral part of design"-Discuss

Safety should be an integral part of any engineering design. A thing is safe if its risks are justified to be acceptable designer thing is said to be safe if for the person who judges the perceived risk is less and it is unsafe if the perceived risk is high .In short, safety means an acceptable risk.

But the definition of Lawrence has some drawbacks as follows:

- Under Estimation of Risks: An unsafe product may be considered to be safe, because of wrong judgement of a person who has not known anything about the product.

  Eg: Buying an ill-designed iron box in a sale only because of law price offered.

(ii) Over estimation of Risks: A product whose risks are comparatively less may be considered unsafe because of extraordinary safety concern of a person .

Eg: Judging fluoride in water can kill lot of people.

- No estimation of risks: For the person who does not judge the risks, the product may be either safe or unsafe.

  Eg: Hiring a car without knowing its safety.

By keeping all these things in mind it is necessary to find the modified notion of safety.

A thing is safe with respect to given person or group at a given time if its risks

were fully known if those risks would be judged acceptable in light of settled value principles.

Other concepts of safety:

Safety can be objective and also subjective .In view of objective safety is a matter of how people would find risks acceptable or unacceptable if they knew the risks and based their judgements on their most settled and values perspectives.

When the value perspectives differ safety becomes objective .so safety is an acceptable risk.

Relative safety can be understood by making comparisons.eg: comparing the safety of a distance travelled bt Air,train and bus.

For Engineers safety would extend to safe operation of products and systems, prevention of natural or human caused disasters.

2.What is meant by Risk in industrial working situations?Explain in detail?

When a thing or a product is proved to be dangerous or hazardous then it is unsafe.

RISK is the potential that something unwanted and harmful may occur. Risk is the possibility of suffering harm or loss.

Risk is defined as the probability of a specified level of hazardous consequences being realized .Risk ®is thus a product of probability(P) and consequence © which is given by the equation R=PxC.

When we undertake something ,which is not safe or by using a product which is not safe.then we are said to be having a risk. Risk covers various types of undesirable occurrences.On the basis of technology risk includes the dangers of bodily harms or economic loss or even environmental degradation.

Good engineering practice has always been concerned with safety.When ever the society is more influenced by technology there is more possibility of facing risks not only by the users but also by the products.

Engineers and Technology have helped to overcome some ill effects of natural disasters such as droughts and floods. But in some areas engineering and technology have increased our vulnerability to natural dangers such as Earthquakes.

A risk may fall into one of the following categories:

- Low consequences,Low probability.
- High consequences,High probability.
- Low consequences,High probability.

- High consequences,Low probability.

We need to concentrate on the third and fourth categories of risk.The third category of events the so called learning incidents is precursors to high consequences of major events.The fourth category comes under the major hazards control and requires special attention .Risk Analysis is mandatory for this category of major events.

A Disaster=A serious continued event, A state of unpreparedness.

Acceptable Risk:

'A risk is acceptable when those affected are generally *no longer (or not) apprehensive* about it.'

Apprehension (i.e. anxiety) depends largely on factors such as

- whether the risk is assumed voluntarily.
- how the probabilities of harm (or benefit) is perceived.
- job-related or other pressures that causes people to be aware of or to overlook risks.
- whether the defects of a risky activity or situation are immediately noticeable or close at hand .
- whether the potential victims are identifiable beforehand.

Voluntary risk and Control:

Though people know that their actions are unsafe their involvement of risk is called voluntary risk.They take up these kinds of risky actions for thrill amusement and fun.The reason for taking these kinds of risk is that they believe that they have full control over their Actions.

For example, John and Ann Smith enjoy riding motorcycles over rough ground for amusement.Some people enjoy participating in car races.They fully know about the risk involved in their actions but they do these things only for pride and amusement.

Effect of information on risk assessments

The manner in which information necessary for decision making is presented can greatly influence how risks are perceived. Consider this example:

In a particular case of disaster management, the only options available are provided in 2 different ways to the public for one to be chosen (where lives of 600 people are at stake).

Alternate 1

If program A is followed, 200 people will be saved. If Program B is followed, 1/3 probability is 600 people will be saved and 2/3 probability that nobody will be saved.

Response

72% of the target group chose option A and 28% option B

Alternate 2

If program A is followed, 400 people will die. If Program B is followed, 1/3 probability is that nobody will die and 2/3 probability that 600 people will die.

Response

This time only 22% of the target group chose option A and 78% option B

Conclusion:

7. The option perceived as yielding firm gain will tend to be preferred over those from which gains are perceived as risky or only probable.
8. Option emphasizing firm losses will tend to be avoided in favour of those whose chances of success are perceived as probable.

Secondary Costs of Products

Cost of products is High, if designed unsafely

- Returns and Warranty Expenses
- Loss of Customer Goodwill
- Cost of litigation

- Loss of Customers due to injuries in using it
- Cost of rework, lost time in attending to design problems

Manufacturer's understanding of the risk in a product is necessary:

10. To help reduce secondary costs
11. To know the possible risk for purposes of pricing, disclaimers, legal terms and conditions, etc.
12. To know the cost of reducing the risks
13. To take a decision before finalizing the design.

Buyer's understanding of the risk in a product is necessary:

- To judge whether he/she wants to take the risks
- To judge whether the 'risk vs. costs' justifies taking the risk.

JOB RELATED RISKS

It depend upon the nature of the job .In most of the cases of employees in high risk jobs don't have any options but to undertake them merely because of compulsion .They rarely use the available safety equipments The reason here is that the employers believe that the tolerance level of their employees are higher than that of the public.

Eg: Working in steel plant,chemical plant etc.

So while designing and equipping the workstations the engineers must consider the above said nonchalant attitude of the employers towards safety particularly when their pay is on a piecework basis. When a single worker complains about unsafe working conditions it should be taken as a serious one and measures must be taken to correct that accordingly.

IV) Magnitude and Proximity:

Our reaction to risk may be affected by the magnification or the personal identification or relationship of the victims. Misperceptions of numbers can easily make us overlook losses that are far greater than the numbers reveal by themselves.

3.Explain safety at the design stage?

Safety consideration of chemical plants start right from the process development stage. It is therefore of great importance to consider the plant safety aspects early in the design stage. The main goal of process design and engineering activity is to see that the plant operates safely at the design conditions. capable of absorbing the effects of minor deviations in the control parameters can be shut down carefully in case of emergencies .Therefore process designers must have a thorough knowledge of the processes, their limitations and the hazards associated with them.Hazards checklisk particular to a process should be prepared and the necessary data to take the safety measures should be collected at the process design stage. An exhaustive checklist goes along way towards identifying the hazards.

Testing a Product carried out to destruction

This type of testing is known as Prototype testing or Destructive testing.

***Some commonly used testing methods*:**

6. Using the past experience in checking the design and performance.
7. Prototype testing. Here the one product tested may not be representative of the population of products.
8. Tests simulated under approximately actual conditions to know the performance flaws on safety.
9. Routine quality assurance tests on production runs.

The above testing procedures are not always carried out properly. Hence we cannot trust the testing procedures uncritically. Some tests are also destructive and obviously it is impossible to do destructive testing and improve safety.

In such cases, a simulation that traces hypothetical risky outcomes could be applied.

11. Scenario Analysis (Event -> Consequences)
12. Failure Modes & Effects Analysis (Failure modes of each component)

v) Fault Tree Analysis (System Failure -> Possible Causes at component level)

vi) What if there is a combination of factors?

vii) All Analysis pre-suppose a thorough understanding of the physical system

Scenario Analysis (Event -> Consequences

It is a general and common approach .In this analysis while testing the safety of a product, a person has to start from a given point and then study all the different consequences developed gradually from it.

Failure modes and effect analysis (FMEA) :

This approach systematically examines the failure modes of each component, without however, focusing on relationships among the elements of a complex system.

Fault Tree Analysis (FTA) :

A system failure is proposed and then events are traced back to possible causes at the component level. The reverse of the fault-tree analysis is 'event – tree analysis'. This method most effectively illustrates the disciplined approach required to capture as much as possible of everything that affects proper functioning and safety of a complex system.

Event Tree Analysis

It has been found to be very useful in identifying a potentially hazardous situation in the plant. This analysis is the reverse of the fault tree analysis. It is mathematically oriented version of scenario analysis

All the above analyses need a thorough understanding of the entire physical system of all these analysis. The Fault- Tree method is mostly preferable one, as it explains the possible approaches for proper functioning and safety of a complex system. This can be explained with the following example that relates to a steam system plant without filtration .

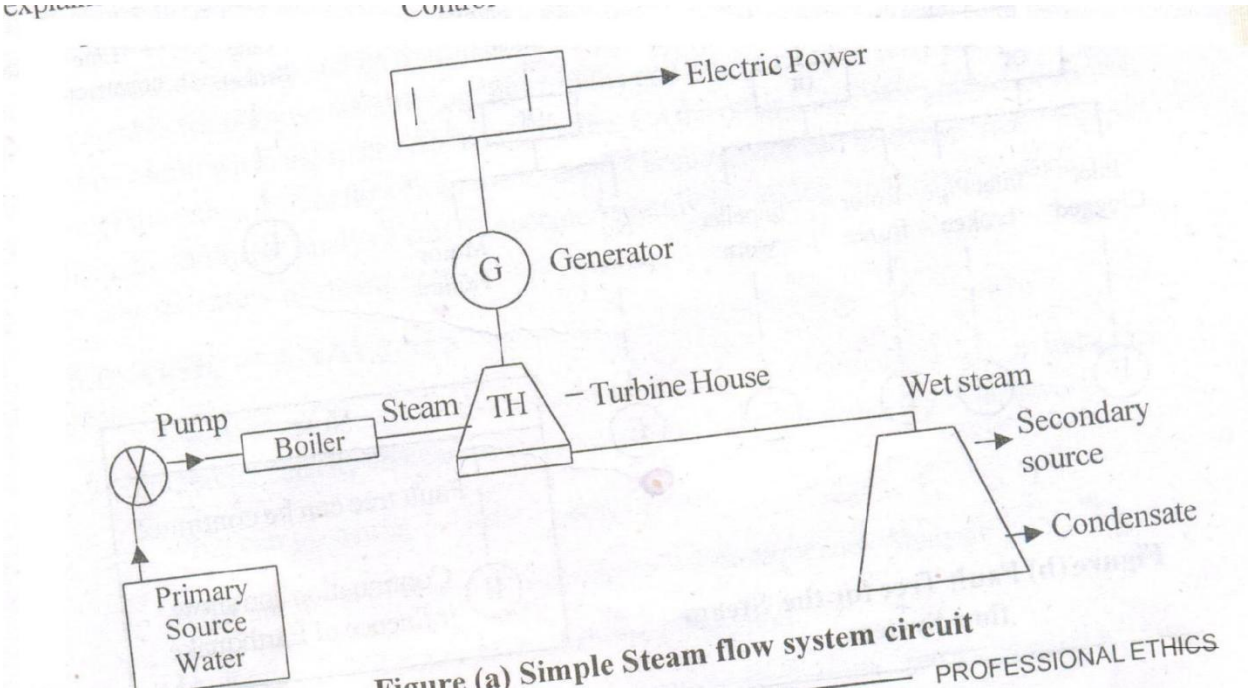


Figure (a) Simple Steam flow system circuit

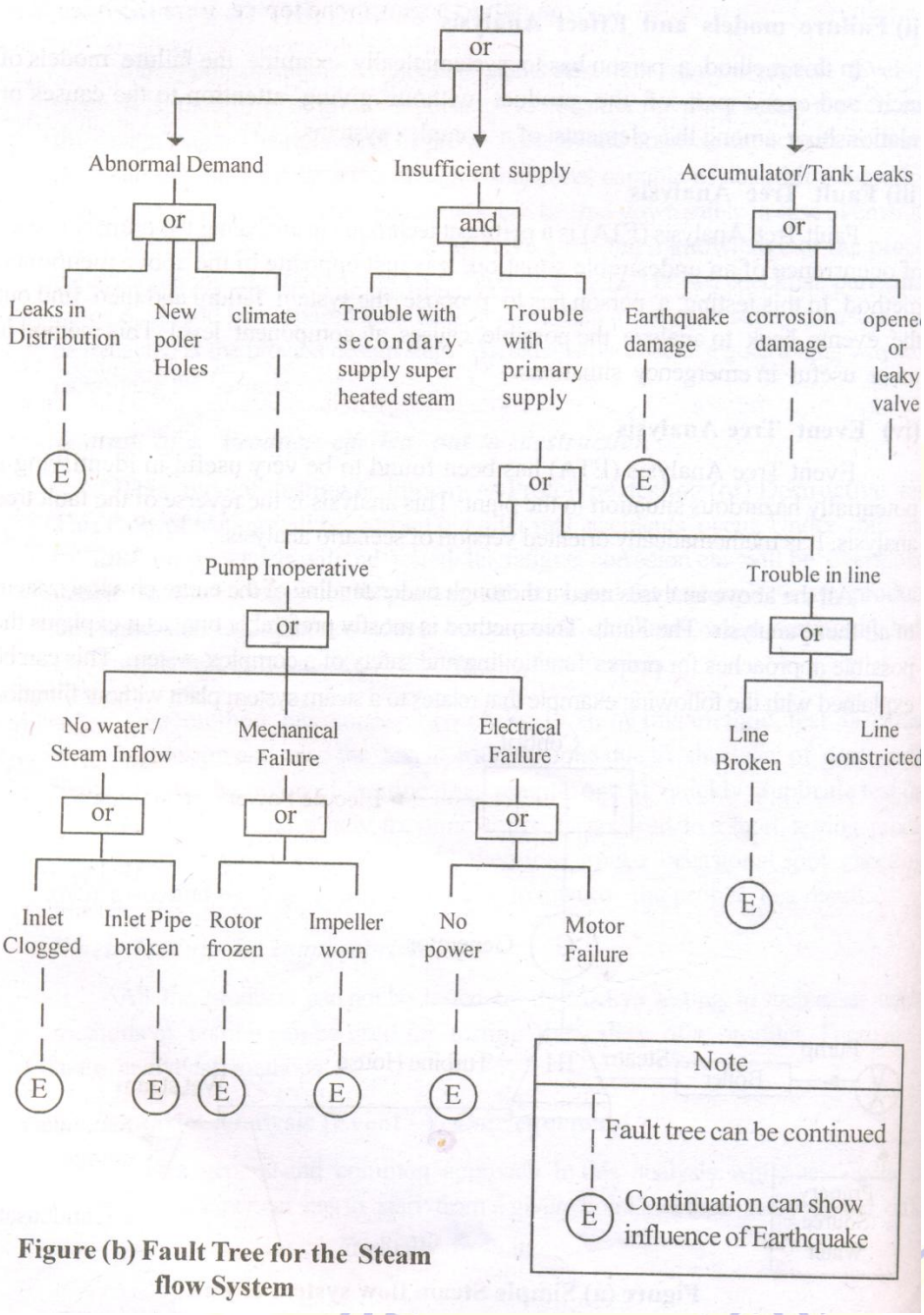


Figure (b) Fault Tree for the Steam flow System

In the above steam system the failure begins in the top i.e. from the river as a primary source, and it leads to the failures in various subsystems, components, and out side factors

which finally caused the problem. Each level in the tree depicts the events which caused the problem in each level. i.e., one or more events will be the cause for the event at the next higher level.

The fault tree given above is incomplete. There are so many further levels that can be extended and sometimes there may be some possible omissions at any given level. In spite of its incompleteness, the fault tree given in the diagram gives a good qualitative sense of the various types of risks in the given steam system. The correctness of each event will always be problematic, particularly when there is the chance for failures in the common-mode event. For example, an earthquake can damage not only the accumulator/ receiver tank but also can damage all the subsystems. Finally, it will affect the transport of steam. So in this case, earthquake is the common-mode. In the case of the disaster of the ship Titanic, the common-mode is the night time. The iceberg could not easily be *'visible* at night, the radio operator of the nearby ship was in deep sleep. Suppose the tragedy had happened in the daytime, many of the lives could have been saved. So, predicting the common-mode events is a very difficult one.

The advantage of fault-tree analysis is its qualitative aspect. It helps us to foresee the situations .In analyzing a realistic water or steam system we have to check the availability of superheated steam and its usefulness. For example, highly corroded steam can not be acceptable for purpose of rotating the turbine and even supply of feed water also may not be useful when the filter system is a failure. On the other hand, when no water comes out of the valve, it may flow from the reservoir! accumulator can be transported by pipe lines . So fault-tree analysis can be accepted mainly for taking emergency measure for testing the safety of steam flow or a product.

4.Explain Risk Benefit Analysis?-Explain

Risk-benefit analysis is a method that helps the engineers to analyze the risk in a project and to determine whether a project should be implemented or not. It is very much closer to cost-benefit analysis. In risk-benefit analysis, the risks and benefits of a product are allotted to money amounts, and the most benefitable ratio between risks and benefits is calculated. But it is a very difficult job, as the risks are much harder to quantify and more difficult to put a realistic price tag on. But when used objectively, this analysis will be a useful technique as a part of a larger analysis. When applying the risk-benefit analysis, a person must consider who takes the risks and who harvests the benefits. Therefore, for an engineer, the only ethical way to conduct a risk-benefit analysis is to ensure to the greatest extent possible that the risks as well as the benefits of his design are equally shared in the society around him.

- Both risks and benefits lie in future. So, there is a chance for heavy discounting of future because the present low value of costs or benefits will not give a true picture of future distresses.
- Both have similar uncertainties but at the same time it is very difficult to arrive at expected values
- What are all the benefits of one person may be risk to another
- Can we express risks and benefits in a common set of units? For example, when the risks can be expressed in one set of units (deaths on the high way and benefits in another, we can find only the ratio of risks to benefits for different designs when comparing the designs.

REASONS FOR RISK-BENEFIT ANALYSIS

5. Risk-benefit analysis is concerned with the advisability of undertaking a project.
6. It helps in deciding which design has greater advantages
7. It assists the engineers to identify a particular design that scores higher with that of another one.

ETHICAL IMPLICATIONS OF RISK-BENEFIT ANALYSIS

Risk-benefit analysis is also helpful to find answers to the following questions in anethicalway.

i) When is a person given a right to impose a risk on another in view of a supposed benefit to others?

(ii) How do we consider the worst case scenarios of persons exposed to maximum risks while they are receiving only minimum benefits? Are their rights violated?

(iii) Are they provided with safer alternatives?

So engineers should keep in mind that risks to known persons are perceived differently from statistical risks and they have no control over the grievance redressal

WEIGHING THE RISKS AND BENEFITS

To weigh the risks and benefits, an engineer should keep in his mind the ethical question "Under what condition, some one in society can be entitled to impose a risk on someone on behalf of a supposed benefit to yet others".

So, to weigh them properly, it is necessary to bring in a value system for the risks involved for different situations.

Personal Risk

An individual who is given sufficient information, will be in a position to decide whether to take part in a risky activity or not. Individuals are more ready to take on voluntary risks than involuntary risks even if the voluntary risks are more dangerous.

There are so many difficulties in assessing personal risks particularly in case of involuntary risks. It is very difficult to assess the involuntary personal risks. Examples being (i) Living near a refinery (ii) Locating a nuclear power plant. In light of the above difficulties, the issues related to assess the personal risks are as follows: (i) How do we assess the money value of the life of an individual? (ii) Is the compensation based on tolerance of an average person? (iii) What will be the compensation if his tolerance level is below or above average?

To overcome these difficulties in assessing personal risks is that analysts should have all the available quantitative measures such as (i) Assessing voluntary activities - e.g., Life Insurance taken (ii) Assessing dangerous or risky job-worker can demand for increased wages to carry out the job. On the basis of the above assessments, we have to adopt a procedure to assess personal risks that have been overseen by trained arbiters.

Public Risk and Public Acceptance

Risks and benefits to the public are more easily determined than to individuals, as larger number of people are taken into account.

Assessment studies relating to technological safety can be conducted in a better manner as the statistical patterns taken on greater significance.

National Highway Traffic Safety Administration [NHTSA] of USA, suggested a value for human life based on the loss of future income and other costs associated with an accident. It also provides an estimate of quantifiable losses in social welfare resulting from a fatality and not on the basis for determining the maximum expenditure allocated to saving a life.

Accounting Publicly for Benefits and Risks

Risk benefit analysis is being increasingly challanged. Though the engineers are not interested to face the political or legal areas, they are often called upon as expert witness. There they should remain as objective as possible and desire proper conclusion

Any expert or a group cannot be expected to know everything. Hence the public operations or actions which are designed to create safeguards and reasonable regulations in relation to technology itself suffers from the problem which is already mentioned it is incomplete knowledge. The following are some more problems, which affect the public accountability for risk.

5. The refusal to face hard questions that are caused by lack of knowledge.
6. Caution in stating the probabilities of rare events.
7. Risk assessments are based only on incorrect and unacceptable assumption and data.

The earlier report, prepared for the Atomic Energy Control Board of Canada, stated that non-conventional energy sources were riskier than nuclear energy in terms of fatal and disabling injuries. But the critics argued that there was lack of differentiation among injuries. They also questioned about the reliability of downtime data and the casualties attributable to replacement resources like coal. So, these objections made it very difficult for the engineer to prepare an objective report.

So, the engineer has to do the following activities to safeguard the public

from the risks.

(i) Provide the background material to support or to prove the faulty positions and actively take part in the debate.

(ii) Act as the model of a science court.

(iii) Record the statistics with caution i.e., give reasonable numbers.

(iv) Measure the risks and benefits on a ordinal (relative) scale rather than cardinal (absolute) scale and

8. Ensure the parties affected by the project concerned are polled.

Publicly accounting for risks and benefits is not only related to methods of quantification but also related to qualitative value judgements i.e. the question of justice.

It is wrong to violate some one's rights and or consider the benefits of the project as irrelevant. The solution has to be made morally and humarely. For example, to bring about urban renewal, without destroying the neighbor hood.

5.Explain Chernobyl case study?

This disaster happened in the nuclear power plant complex at Chemobyl near Kiev (Ukrain) in April, 1986. This disaster happened during the construction of units *5 & 6.* The reactors were called RBMK. The RBMK reactors were graphite-moderated and use boiling — water pressure tubes. The engineers were on a test on reactor 4 to decide how long the mechanical inertia of the turbine — generators rotating mass could keep the generator turning and producing electric power after the shut off of the steam supply. This test was arranged to be conducted during a scheduled plant shut down for general maintenance purposes.

To produce 1200 Megawatts output the RBMK reactor requires 3600 megawatts of thermal power. To conduct the test, the unit had been reduced its out put up to 700 Megawatts. But due to an unexpected demand, the power dispatch controller of Kiev (Ukrain) requested the officials of plant 4 to maintain the high output. This necessitates the postponement of the rest. But for conducting the test, the reactor operators had already disconnected the emergency core-cooling system. This was the first mistake done; more over another mistake was that a control device was not properly reprogrammed to maintain power at 700 to 1000 megawatts level. After the demand was over, the plant 4 was authorized to reduce the power and its output falls to 30 mega watts, where as it was very difficult to control the reactor. instead of shutting down the reactor, the operators tried to conduct the test. So they raised all the control rods to increase the power.

The power output was only 200 Mega Watts. This was very low as far as the test was concerned. Yet the test was continued. Circulating pumps had to be started. Under normal levels of power output it would be helpful to the safety of the reactor. But at an output of 200 Megawatts, it required many manual adjustments to maintain the balance between steam and water, The operators stopped all the emergency signals and automatic shut down controls.

This made the reactor in an unsafe position. It allowed the reactor to run freely. With this dangerous condition of the reactor, the engineers started the test. They closed the steam valves and removed the steam load in an effective manner. The

temperature of the reactor increased. In the RBMK reactor water was used only as a medium for transferring the heat. Due to the increase in the temperature of the reactor, it became hotter and the fission rate was increased. This made the increase of the power of the reactor 4. The effect of the power was equivalent to half ton of TNT inside the reactor core. Due to the malfunctioning, the fuel power in the core did not have time to get melted and it spread inside the reactor core as broken pieces. The fuel deprived of its protection cover sjie1d mixed with the water. Within a second, a large explosion occurred. The explosion of the nuclear power heavily damaged the concrete floor of the building and separated the reactor from the refueling area. Because of the formation of hydrogen gas, the reactor caught fire. This caused the graphite to glow and the fuel cast out over the compound of the plant and also the radioactive waves began to spread out in air.

But the surrounding people did not know about this. They came to know only after some hours later. Due to this acute radiation many of the workers in the Chernobyl complex died immediately.

Due to this disaster the toll of death was estimated approximately as 8000. This radioactive power leakage affected even Europe. Even after seven years of the accident, the pilots happened to realize about this power still in the air. The agricultural products were affected due to contamination of radioactive water.

After the disaster, the reactor was put into a concrete base but it was not an air tight box, so the radioactive dust could easily escape. So, some tunnels were dug under the reactor and cooling pipes were installed which were carrying liquid nitrogen. This disaster caused the death of many lives and also affected the agricultural products for many years. This accident was also due to improper training and carelessness of the personnel.

6.Account for some faulty assumptions about safety and state the related reality with respect to the assumptions with suitable example?

Sometimes, Engineers are faced with some terrific tasks that are very difficult to achieve. Such as designing and producing safe products, giving a fair accounting of benefits and risks, meeting the production schedules, and helping the company to maintain profits. Of all the above, though product safety gets its top priority ,practically this is not often seen, because of the most popular misconception or faulty assumption about safety .

A number of techniques are available for reducing risk. Some of the important ones are as follows:

- Application of inherent safety concepts in design. For example, in the case of liquefied gas storage systems ; the present trend is to replace pressurized storages with cryogenic storages at atmospheric pressure
- Use of diversity and redundancy principles in instrumented protection systems
- Regular inspection and testing of safety systems to ensure reliability.
- Training of operating personnel and regular audits to ensure workability of the systems and procedures
- Development of a well considered emergency plan together with regular drills to ensure preparedness

FAULTY ASSUMPTIONS ABOUT SAFETY

(a)Assumption

The main cause of an accident is due to the Operator error and negligence.

Reality

Accidents are caused by dangerous conditions that can be rectified• For example, the introduction of conveyers and lifts for taking heavy loads reduced number of deaths and injuries suffered by industrial workers. Dangerous designs of products result in more accidents than the failure of components of the products.

Assumption

Making a safe product always increases the costs.

Reality

Safety should be built into the product from the beginning to reduce the initial cost. any later changes occur in the design it will result in a costly product.

Assumption

We learn about safety only after a product has been completed and tested.

Reality

People can be affected during the testing stage, if the safety is not built in the original sign itself. Unwillingness to change a design will result in compromising on safety.

Assumption

Warnings about a risk/danger are satisfactory both in quality and quantity. insurance coverage is cheaper than planning for safety.

Reality

Warnings are only able to provide minimal protection against harmful events. insurance rates are very high.

So, for reducing risks, the engineers should recognize that reducing risk is not impossible task, even when financial and time barriers exist.

EXAMPLES OF IMPROVED SAFETY

Safety' is not a written work on the design of a product. The following amp1es will clearly explain that the safety is not based on the possible but unpredictable features

(a) Introduction of magnetic door catch system on refrigerators. It prevents death by suffocation of children accidentally trapped in them. This magnetic door catch now permits the door to be opened from inside easily. It is also cheaper than the older types of spring - locks.

(b) The Dead-man handle for the drivers in trains to control over the speed of the train.

(c) The semaphores used in rail roads that are used for signaling purpose. Semaphore are actuated by cables and when the arm is lowered, it indicates "Stop". Whenever there is a failure in the cables, the position of the arm is always lowered.

(d) The safety belt introduced in the Volkswagen's car ; This belt is an attachment on the door of the car, so that the belt automatically goes in place on entry of a person.

7.What types of risk to be reduced?

REASONS FOR RISK-BENEFIT ANALYSIS

8. Risk-benefit analysis is concerned with the advisability of undertaking a project.
9. It helps in deciding which design has greater advantages
10. It assists the engineers to identify a particular design that scores higher with that of another one.

ETHICAL IMPLICATIONS OF RISK-BENEFIT ANALYSIS

Risk-benefit analysis is also helpful to find answers to the following questions in anethicalway.

i) When is a person given a right to impose a risk on another in view of a supposed benefit to others?

(ii) How do we consider the worst case scenarios of persons exposed to maximum risks while they are receiving only minimum benefits? Are their rights violated?

(iii) Are they provided with safer alternatives?

So engineers should keep in mind that risks to known persons are perceived differently from statistical risks and they have no control over the grievance redressal

WEIGHING THE RISKS AND BENEFITS

To weigh the risks and benefits, an engineer should keep in his mind the ethical question "Under what condition, some one in society can be entitled to impose a risk on someone on behalf of a supposed benefit to yet others".

So, to weigh them properly, it is necessary to bring in a value system for the risks involved for different situations.

Personal Risk

An individual who is given sufficient information, will be in a position to decide whether to take part in a risky activity or not. Individuals are more ready to take on voluntary risks than involuntary risks even if the voluntary risks are more dangerous.

There are so many difficulties in assessing personal risks particularly in case of

involuntary risks. It is very difficult to assess the involuntary personal risks. Examples being (i) Living near a refinery (ii) Locating a nuclear power plant. In light of the above difficulties, the issues related to assess the personal risks are as follows: (i) How do we assess the money value of the life of an individual? (ii) Is the compensation based on tolerance of an average person? (iii) What will be the compensation if his tolerance level is below or above average?

To overcome these difficulties in assessing personal risks is that analysts should have all the available quantitative measures such as (i) Assessing voluntary activities - e.g., Life Insurance taken (ii) Assessing dangerous or risky job-worker can demand for increased wages to carry out the job. On the basis of the above assessments, we have to adopt a procedure to assess personal risks that have been overseen by trained arbiters.

Public Risk and Public Acceptance

Risks and benefits to the public are more easily determined than to individuals, as larger number of people are taken into account.

Assessment studies relating to technological safety can be conducted in a better manner as the statistical patterns taken on greater significance.

National Highway Traffic Safety Administration [NHTSA] of USA, suggested a value for human life based on the loss of future income and other costs associated with an accident. It also provides an estimate of quantifiable losses in social welfare resulting from a fatality and not on the basis for determining the maximum expenditure allocated to saving a life.

Accounting Publicly for Benefits and Risks

Risk benefit analysis is being increasingly challanged. Though the engineers are not interested to face the political or legal areas, they are often called upon as expert witness. There they should remain as objective as possible and desire proper conclusion

Any expert or a group cannot be expected to know everything. Hence the public operations or actions which are designed to create safeguards and reasonable regulations in relation to technology itself suffers from the problem which is already mentioned it is incomplete knowledge. The following are some more problems, which affect the public accountability for risk.

9. The refusal to face hard questions that are caused by lack of knowledge.
10. Caution in stating the probabilities of rare events.
11. Risk assessments are based only on incorrect and unacceptable assumption and data.

The earlier report, prepared for the Atomic Energy Control Board of Canada, stated that non-conventional energy sources were riskier than nuclear energy in terms of fatal and disabling injuries. But the critics argued that there was lack of differentiation among injuries. They also questioned about the reliability of downtime data and the casualties attributable to replacement resources like coal. So, these objections made it very difficult for the engineer to prepare an objective report.

So, the engineer has to do the following activities to safeguard the public from the risks.

(i) Provide the background material to support or to prove the faulty positions and actively take part in the debate.

(ii) Act as the model of a science court.

(iii) Record the statistics with caution i.e., give reasonable numbers.

(iv) Measure the risks and benefits on a ordinal (relative) scale rather than cardinal (absolute) scale and

12. Ensure the parties affected by the project concerned are polled.

Publicly accounting for risks and benefits is not only related to methods of quantification but also related to qualitative value judgements i.e. the question of justice.

It is wrong to violate some one's rights and or consider the benefits of the project as irrelevant. The solution has to be made morally and humarely. For example, to bring about urban renewal, without destroying the neighbor hood.

8.Explain Government Regulators approach to risk.

Defining Market Conduct Regulation

"**Market conduct**" encompasses any product or service relationship between the insurance industry, insurers, agents and individuals alike, and the public. It is influenced by many factors including: laws, established best practices, codes of conduct, and consumer expectations.

To protect the public from unfair market practices, CCIR members oversee a wide range of company and intermediary practices (e.g. sales, underwriting, and claims processing) through a variety of regulatory activities such as licensing, consumer complaint reviews, and on-site examinations. Taken together, these regulatory practices are referred to as market conduct regulation.

Defining Risk-based Market Conduct Regulation

Risk-based Market Conduct Regulation means directing regulatory efforts to the most significant issues that either have the greatest potential for consumer harm or that could weaken public confidence if left unchecked. In a risk-based approach, regulators prioritize issues based on their potential impact (risk) to the achievement of desired regulatory outcomes.

Our overall vision for RbMCR includes regulators working with each other and the industry to identify, prevent, and solve marketplace problems or harms and to work toward positive marketplace outcomes.

Most regulatory agencies that have adopted risk-based techniques have done so because they judge that risk-based methods are the best way to meet their mandate to supervise financial markets in the way that best accomplishes the goals of legislation and regulation and ensures confidence in the financial services sector.

For example: Legislation may indicate that insurers must honour legitimate claims within a certain period of time after completed claims forms are filed. A risk-based approach could be used to focus regulatory attention on insurers where indicators suggest there is a high risk of non-compliance with the legislation rather than giving every insurer equal weight and examining them all.

Marketplace Outcomes that Market Conduct Regulation seeks to achieve

By setting up regulatory regimes, governments have attempted to achieve certain public policy goals. Moving toward a risk-based market conduct approach will require that both the regulators and stakeholders have a common understanding of what these desired outcomes of regulation are.

In its work to date CCIR has considered numerous mission statements and goal documents from around the world and we believe that the following marketplace outcomes (or public policy goals) describe the goals of market conduct regulation in Canada.

These desired marketplace outcomes include both micro-level outcomes that are within the control of individual firms or intermediaries and broader systemic level outcomes that can only be achieved though the collective actions of the entire industry. It is expected that realized.

Micro-level outcomes:

Fair treatment of consumers and claimants

Ethical and honest behaviour should be the accepted norm among market participants.

Disclosure of information to enable consumers to make informed decisions

In keeping with fair treatment, consumers should have access to simple, easy to understand information.

Compliance with laws

Market participants must comply with statutory, legal and corporate obligations.

Good corporate governance

Companies should identify and manage risks through internal controls, risk management and business oversight mechanisms.

Systemic level outcomes:

Stable marketplace

In which the needs of consumers for understandable, available, accessible and affordable insurance are met;

Proactive identification of issues

Collaboration between industry and regulators to prevent issues from arising rather than merely fixing problems after they happen; and

Fair Dispute Resolution

A process by which disputes are dealt with by participants in a fair, timely and responsive manner.

What are the Potential Benefits of a Risk-based Approach?

It is clear from discussions among regulators, both domestically and internationally, that risk-based regulation, increased standards for corporate governance and outcome oriented regulatory standards are closely inter-related. Taken together, their adoption by regulators appears to greatly enhance the efficiency and effectiveness of the regulatory paradigm. There are potential benefits for all parties – consumers, intermediaries, insurers, regulators, and governments - in a risk-based approach to market conduct regulation. These include:

Clarity and transparency of regulation

Because the identification and prioritization of risk requires an ongoing dialogue between regulators, consumers and industry, a risk-based approach would contribute to the clarity and transparency of the regulatory process.

Better understanding of risks

This continuing dialog will also assist market participants, over time, to a better understanding of actions that constitute risks to the achievement of the marketplace outcomes regulators are trying to achieve.

Alignment with corporate governance

As this dialogue is centered on risks to marketplace outcomes, it is better aligned with enterprise risk management within the insurance industry. This alignment underscores the importance of corporate governance in modern regulation. If members of the industry understand the marketplace outcomes regulators are trying to achieve and how regulators assess risk to those outcomes, they can more readily assess the risk implications of their actions and see the areas where their internal

policies and procedures need to be improved to keep risks in check.

Proactive approach to preventing or solving problems

Sound knowledge of the risks which may impede desired marketplace outcomes increases the probability that solutions can be found before potential risks become major problems. Problems with the potential for a big impact on individual consumers or that affect a large number of market participants would be addressed by regulators first. In this way, risk-based approaches to market conduct regulation provide a method for proactively zeroing-in on issues that have the greatest relevance.

Systemic focus on market place and consumers

Traditional methods of enforcing market conduct are, by their nature, reactive; designed to catch and punish. As such, they sometimes have a limited impact on overall conduct in the marketplace. A risk-based approach focuses regulatory efforts on market place outcomes, thus providing a systematic focus that has sometimes been missing in traditional market conduct regulation.

Increased regulatory efficiency

A regulator's key role is to enforce laws put in place to protect consumers. Risk-based approaches provide a more efficient way of doing that by dealing with problems that may affect many consumers at one time, rather than dealing with them solely on a case by case basis. As well, the risk-based approach recognizes that regulatory resources, both human and financial, are limited and choices must be made. In a risk-based regime, these choices are based on identified risks to marketplace outcomes, allowing regulators to have a greater impact with their limited resources.

Reduced regulatory costs for well managed market participants

It is anticipated that market participants that manage their market conduct risks well will benefit by receiving less intensive regulatory scrutiny or intervention than higher risk participants.

Regulatory Principles for Risk-based Market Conduct Regulation

Regulators have considered a variety of principles for risk-based regulation. Thus far, there is agreement that the following regulatory principles should form the basis of our risk-based market conduct regulatory approach. These are principles for regulators to follow, though each of them also implies complimentary principles for industry

participants.

.Developing Understanding

To move from enforcing rules to assessing degrees of achievement of marketplace outcomes will require regulators to have a fulsome understanding of the market and its participants.

Regulatory understanding falls into three categories:

a. ***The external environment***: includes an understanding of economic and business conditions. This can be achieved through scanning the media and independent market analysis, including those prepared by other government agencies, about information that may influence the conduct of market participants;

b. ***Consumer and system-wide risks***: these may be broad issues (e.g. e-commerce) which require very careful definition of the issues involved, or they may be focussed on a particular product or a vulnerable consumer group (e.g. seniors). In any case, the regulator may seek information through an informal survey or visits with company managements to gain a better understanding of the matter;

i. ***.Market participants***: information from individual complaints may identify potential

ii. problems before they become more serious or systemic.

2.Reliance on Governance and Controls

Regulators should emphasize governance as the focus of their risk analysis and assessments of companies and intermediaries. It is the responsibility of boards and senior management to adopt governance practices, policies, procedures and systems that will lead to successful market conduct outcomes. Regulators will expect and rely on good corporate governance as a means of ensuring that individual firms and intermediaries are in compliance with marketplace standards.

3. Exercising Judgement

Regulators should use their understanding and exercise sound judgement when

assessing risk and deciding where to spend their finite resources. Regulators will address the most important things first.

3. Risk Assessment and Management

Regulators' actions should be commensurate with risk. Where possible, regulators will set levels of tolerance for various market risks that are appropriate for their jurisdictions. Regulators will respond to risks in a measured way, focusing on the most significant risk first and keeping in mind the regulatory objectives. Regulators will give due consideration to market conditions, risk profiles (participant's size, nature and complexity), key issues, any mitigating action taken by the participant, and past supervisory findings.

Selective use of Tools

Regulators should develop and use a broader range of tools and apply the ones that are best suited to achieving a particular desired regulatory outcome. The categories of tools will include:

a. **Diagnostic**: designed to identify, assess and measure risks (e.g., desk based reviews and analysis of information or reliance on external auditors);

b. **Monitoring**: to track the development of identified risks, wherever they arise (e.g., supervisory team visits or requests for additional information);

c. **Preventative**: to mitigate identified risks and prevent them from becoming more serious (e.g., letters to CEO/Board or imposition of conditions or directions);

d.Remedial: to respond to risks when they have emerged (e.g., exercising powers of intervention or revocation of authorizations);

e.Enforcement: to rectify unacceptable or unmitigated risks (e.g., revocation of authorizations or prosecution).

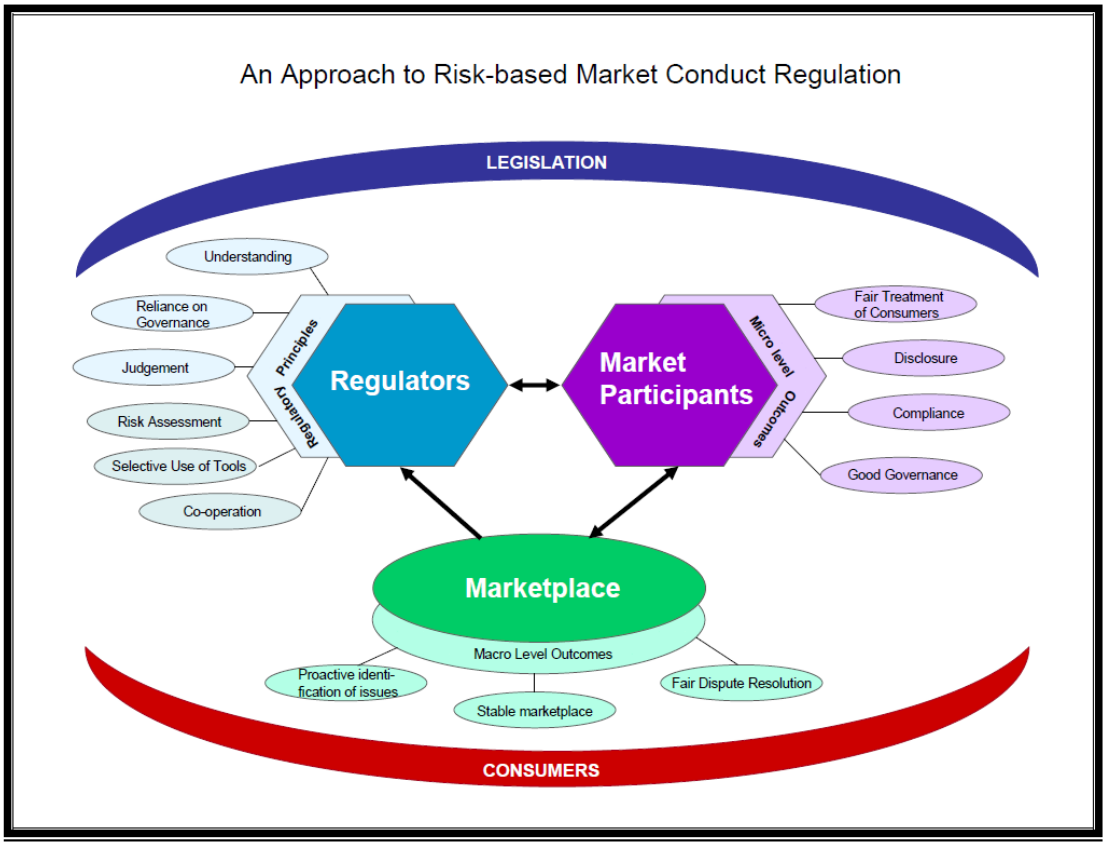
Co-operation

Regulators should find ways to improve co-operation and information sharing with each other and industry. Many market participants operate in more than one Canadian

jurisdiction and there is a need for regulators to co-operate to enhance regulatory understanding and avoid unnecessary duplication and delays.

Regulators also need to work co-operatively with market stakeholders and participants to keep in touch with market changes and encourage development and adoption of industry codes of conduct and other market guidance.

Below is a graphic representation of our vision of how these various aspects fit together into an ongoing system.



The outcomes and principles of risk-based market conduct regulation will be finalized at the end of this consultation and implementation will begin.

Implementing RbMCR will require the following key components to move forward at the same time. Regulators will:

Adopt and apply the RbMCR principles in our everyday work

Regulators, individually and collectively, will increasingly apply the principles and approaches outlined in this paper to their market conduct activities.

While application of the principles will begin immediately, it should be noted that changes will be incremental in most jurisdictions: they will take time and will not appear in all places or on all topics at the same time.

Work With Insurance Councils to ensure they apply the RbMCR principles

Regulators in jurisdictions with Insurance Councils will bring the RbMCR principles to the attention of the Councils and encourage them to apply the principles to their work.

Support Industry Association Efforts Promoting Adoption of Best Practices

Regulators will support the continuing development and implementation of sound governance practices, standards and guidelines throughout the industry which, in turn, will give rise to high standards of market conduct performance and compliance.

Support Industry Ombudservices

The existence of a fair and effective consumer dispute resolution system will allow regulators to concentrate their resources on dealing with problems with the potential to negatively affect consumer confidence in the Canadian insurance system, knowing that other consumer issues are being dealt with objectively by the OmbudServices.

Identify legislative barriers

In the course of developing and implementing risk-based processes, it is possible that regulators or industry may identify legislative requirements that are not amenable to risk based market conduct regulation. As such issues arise, regulators will bring them to the

attention of legislators.

UNIT IV

RESPONSIBILITIES AND RIGHTS

1. **What is meant by collective Bargaining and what are its ethical features in the engineering profession**.

The ethical features of professionalism in the field of engineering are said to be ,not consistent with union ideology and practice. To some extent, it is impossible for engineers to be dedicated to the ethical standards of professional conduct and loyal to their employers when they are being members of an union. The unionism and professionalism are said to be conflicting with each other. Professionalism considers the interest of the society and of the employer where as unions are acting as the bargaining agents for improving the economic interests of the members against their employers.

When collective bargaining exists, loyalty to employers and the public is not possible. The National Society for Professional Engineers have given in their codes of ethics that the engineers shall not actively participate in strikes and other collective forcing action against their employers.

Engineers are of the view that the unions are limited institutions, which perform only certain limited functions. The size of a union is mainly depending on how well it does its functions. Professional societies like NSPE, ISTE etc also oppose unionism due to the conflicting loyalties and the thought of it as unprofessional. We can determine the good or bad effects of collective bargaining only on the basis of the given situation. In most of the cases, unions have misused their power and act with the public in an irresponsible manner.

Arguments in favour of Unions

i). Unions play **a** predominant role in creating healthy salaries and in promoting high standard of living for the workers. The non-unionized workers can also get the above benefits when their employers are forced to pay.

ii) Unions help in creating a greater sense of participation among the employees in the affairs of the company such as decision making etc.

iii) Unions give job security and protection against random treatment to the employees.

iv) Employees' union can also resist the orders to perform unethical acts.

v) Unions help to provide a most effective and good grievance procedure for the complaints of employees, so that, stability can be maintained.

vi) Unions also help to avoid extreme political interference which exploits the employees.

Arguments against unions

i) Unions are the main cause for inflationary condition of a country.

ii) Unions can cause great destruction to the economy of a nation by placing misrepresenting influences on the efficient uses of labour force.

iii) Unions encourage an opponent decision-making rather than co-operating decision-making.

iv) Unions remove individual negotiations between employers and employees and make the employee as a part of the collective bargaining group.

v) Unions promote disqualified workers and discourage initiative among the workers by stressing job security and by making promotion on the basis of seniority.
vi) Unions prevent the management from rewarding individuals according to their personal achievements, because they insist on salary negotiation only according to the job description and seniority.
vii) Unions also pave the way for pigeon-holing of employees in narrow job classifications to which the salary scales are attached.
viii) Unions also encourage dissatisfied and tensioned relationships between the workers and the management.

2.Discuss the concept of confidentiality with respect to professional ethics?

A distinguishing characteristic of the professionals is keeping certain information of the client's secret confidentially. This is a well-recognized principle in a profession such as medicine, where the patient's medical information must be kept confidential. In law, the defence attorneys must keep client's information confidential and teachers must keep at least personal information about their students confidential. In case of engineering profession, the engineers have an obligation to keep the proprietary information of their companies and their clients confidential.

Confidential information

It means the information which is to be kept secret. Any confidential information should be kept in secret for the purpose of running the organization effectively.

Terms associated with confidential information:

(i). Privileged information

These are available only on the basis of special privilege such as the privilege consistent with an employee who is working on a special assignment. It includes information that has not yet become to public or known within an organization.

(ii) Proprietary information

This information is owned by a company. It refers to a new knowledge established within the organization that can be legally protected from use by others.

(iii) Trade secrets

Trade secrets are given limited legal protection against employee or contractor abuse. These secrets may be about designs, technical processes, plant facilities, quality control methods, list of customers, business plans etc.

(iv) Patents

Patents differ from trade secrets. Patents legally protect some specific products from being manufactured and sold by other competitors without any written permission of the patent holder. No such protection exists in the case of trade secrets. A patent holder has legally protected monopoly power. But in case of trade secrets, the legal protection is limited to keeping relationships of confidentiality and trust.

viii)

Why should engineering information be kept confidential?

Most of the information can directly affect the company's ability to compete in the market place such as how a business is turning out its products, its customers and suppliers. These information may be used by a competitor to capture the market. So, such kind of information should be kept confidential in the good interest of the company to the possible extent.

ix)

Types of confidential information

It has been divided into two groups:

(I) Obvious information of confidentiality

This refers to test results and data, information about the unreleased products, designs of products, formulae for products and technical processes of the products etc.

(ii) Information of lesser confidentiality

This includes all business information such as the number of employees working on a project, the identity of suppliers, marketing strategies, production costs and production yields etc.

x) Most of the companies follow strict policies regarding the disclosure of business information and make all the employees to sign in them. The internal company communications are marked as "Proprietary". Engineers who are working for a client are required to sign in a nondisclosure agreement. In case of engineers, working for government especially in defense industry they have more strict requirements about secrecy entrusted on them and may even require a security clearance before entry to work.

Justification and limit of confidentiality

The confidentiality obligation can be justified at two levels. The first level focuses on three moral considerations i.e., respect for autonomy, respect for promises and regard for public well-being. Let us consider them one by one.

(i) Respect for autonomy

It means to respect the autonomy freedom and self-determination of individuals and corporations in order to identify their legitimate control over the private information of themselves. Without this control, they cannot keep their privacy and protect their self-interest. The employers must have some control over the private information about their companies. This part of control is said to have no limits, because the respect for privacy is not an accurate moral principle.

(ii) Respect for promises

This refers to giving respect for the promises between the employer and the employees. Employees should not disclose the promises which are made with their employer. The information may be considered sensible by the employer. Promises do not establish complete obligations.

(iii) Respect for public or social well-being

For the sake of the public benefits, this moral consideration is essential in identifying confidentiality relationships within professional circumstances. For example, the patients may get confidence in doctors, if the doctors do not reveal their private information. Then only patients can discuss their personal problems with doctors freely. It is based on the confidentiality. Likewise, the economic benefits of competitiveness within a free market may be promoted only when the companies can maintain confidentiality about their products.

The second level is to appeal to the major ethical theories. Employers have some moral and institutional rights to take a decision regarding what sort of information about their companies can be released publicly. They have these rights as a part of their charge to protect the interest of their organizations. There are different ethical theories which help to justify the rights in different ways. They are:

(i) Right-based theories

The right ethicists justify employees' obligations of confidentiality by appealing to basic human rights. For example, consider the rights of stock holders and the right to intellectual property of corporations. No employer is said to have a right to safeguard proprietary information by preventing the engineers from blowing the whistle in case they have to save human lives and rights.

(ii) Duty-based theories

Duty ethicists, stress the basic duties of employers and employees to upkeep the trust placed in them when they have committed themselves to an agreement. They should also not

abuse the property of others.

(iii) Utilitarian theories

a) The rule-utilitarian justified the rules of confidentiality only when such rules produce the most good for the general public. They stress on, how investors get profit and how the society gets benefited. Of course, the limit in this case is depending on rules for keeping confidential information's that don't produce good outcomes.

b) The Act-utilitarian focus on each situation when an employer decides on some matters to be counted as confidential information.

Gray areas in the context of confidentiality

The obligation of protecting confidential information does not cease when employees change their jobs. The former employer will reveal information quickly to their new employers. Though it must legally be maintained even during a move to a new employer in the same technical area, this is very difficult to practice. Because even if, no specific data is revealed, the engineer takes with him a great deal of already gained knowledge of works, materials to choose, and parts not to be chosen etc., which he is not expected to forget. The courts evolved a balance between the competing needs and rights of an individual and the company as follows:

(i) The employee is given the right to seek career advancement wherever they choose and
(ii) The companies have the right to keep information away from their competitors.

The burden of ensuring that both these competing interests are recognized and maintained lies only with individual engineer.

Management policies for maintaining confidentiality

What should be done to recognize the personal interests and rights of engineers, and other employees while recognizing the rights of employers? How to maintain the confidential information of former employers, while the obligation is to faithfully serve for new employers? There are no direct answers to these questions. In order to solve them wisely, the following general management policies can be used.

(i) Use of employment contracts that place special restrictions on future employment. But this kind of contract threatens the rights of the individuals to pursue their careers freely
(ii) Put tight controls on the internal flow of information by restricting access to trade secrets. But this approach may create a feeling of distrust in the work place.
(iii) Following oral agreements like not hiring the important employees of other companies. But this approach leads the best engineers to turn away to other fields.

So, a nice solution is that the employers have to create a sense of professional responsibility among their employees that should reach their mind rather than merely obeying the instruction of current employers.

3. Define Intellectual Property Rights and discuss the tools of IPR and features in detail.

The Intellectual Property Rights (IPR) will have wide range of socio economic technological and political impacts. The obligation under the Trade Related Intellectual Property Rights System (TRIPS) means all the members of World Trade Organization (WTO) are supposed to implement natural systems of minimum standards.

Rapid technology obsolescence and fierce competitions lead one to protect the innovations using the tools of IPR such as patents, trade marks, service marks, industrial design registration, copy rights and trade secrets. The legal frame work for IPR is in a stage of dynamic adjustments and changes to accommodate the challenges and new situations that result from convergence of technology.

The prime importance of intellectual property in India is well established almost at all levels like statutory administrative and judicial. The agreement established by the World Trade Organization (WTO) and agreed by Trade Related aspects of Intellectual Property System (TRIPS) was ratified by India in January 1995. This agreement has established some minimum standards for protection thereby enforcing the intellectual property rights in member countries. This sort of enforcement of agreement / law is required to promote effective and sufficient protection of intellectual property rights in order to reduce distortions and impediments for international trade. Such agreements establish the norms and conditions with regard to the following intellectual properties.

a. Patents
b. Plant Varieties
c. Undisclosed information
d. Design of Integrated Circuits
e. Industrial Design
f Trademarks
g. Copyrights and
ii Geographical Indications.

Intellectual property (IP) is the information and original expression that derives its original value from creative ideas with a commercial value. Intellectual property permits the people to have fully independent ownership for their innovations and creativity like that for their own physical property. By providing guard for such innovations, the owner of IP can be encouraged for further innovations to the benefit of the society in general. It may not be possible to protect IP and obtain intellectual property rights unless they have been applied for and sanction obtained.

Many countries having large number of local industries with innovative designs have specific laws to safeguard the innovations by some regulations with respect to copying of inventions, identifying symbols and creative slogans. As in other developing countries, India too showed for quick enforcement of intellectual property right protection laws. India has to comply being a member of WTO for such implementation of laws at least by 2005. As Biligates, the CEO of Microsoft Corporation and IPR conscious business leader, has distinguished India as a promising base for software development. India's IPR scene is no

deterrent to foreign companies. These laws consist of distinct types of intangible properties.

Essential elements of intellectual property rights

IPR is a broad term for covering

1) Patents for inventions
2) Copyrights for material
3) Trademarks for broad identity and
4) Trade secrets.

These properties are termed in general as "Intellectual Property". Intellectual Property is an asset that can be bought or sold, licensed and exchanged. But ofcourse unlike other properties, intellectual property is intangible; rather it cannot be identified by its specific parameters. These properties are protected on a national basis.

Patents

This refers to innovations — new or improved product and processes which are meant for industrial applications. This is a territorial right which needs registration for a limited time. Patent is a contract between an inventor as an individual and the society as a whole. The inventor has exclusive right to prevent anybody making use of and/or selling a patented invention. Ofcourse this is only for a specific period of time till the inventor discloses the details of invention to the public.

Unlike other rights, this protects effect, but not image or expression. A well crafted patent can give monopoly rights to business in its area. A patent is expensive but the preparatory step are cheaper.

The legal authority in this patent right s the World Trade Organization (WTO) agreement with respect to Trade Related Aspects of Intellectual Property Right (TRIPS), This provides the international standard for the required duration of 20 years from the date of filing the patent. Once this period is over, people are free to make use of this invention as they like. However, though the member has a right to prevent others making use of his patented invention, the owner has no right to make use or sell the invention itself. Patents are granted under national laws. These rights are enforceable by civil laws rather than criminal proceedings.

The TRIPS agreement should provide patent for any invention, be aproductora process, provided they are entirely new, involving an inventive method and suitable for industrial applications. In other words the patent must be a novel and a useful one and capable of practical application and more specifically it must be "non obviousness".

Requirement for Patents

While applying for a patent certain documents have to be submitted as essential requirements. Some of them are as follows:

1. Problem of invention
2. Current report of the problem to be addressed
3. Solution or procedure to the problem
4. Extent of novelty or inventive
5. Application or uses
6. Details of the inventor
7. Resources of funds

Types of patents

i) Utility patents ii) Design patents iii) Plant patents

I) Utility patents

Utility patent can be granted to anyone who invents or discovers any new and useful process, machine, manufacture or composition of matter, or any new and useful improvement thereof. Utility time is of 20 years.

"Process" refers to industrial and manufacturing methods. "Manufacture" refers to articles manufactured. "Composition of matter" relates to chemical compositions and may include mixtures of ingredients as well as new chemical compounds.

ii) **Design patents**

Design patent can be granted to any one who invents a new, original ornamental design for an article of manufacture. A design patent protects the ornamental design (i.e., appearance) of the article. A design patent has a term 14 years from the date of filing.

iii) Plant patents

Plant patent can be granted to any one who invents or discovers and asexually reproduces a new variety of plant. A plant patent has a term of 20 years from the date of filing

Copy rights

A copyright is a very specific and exclusive right even for reproduction of an original work This is for material, literacy, aesthetic material, music, film, sound recording, broad casting, software and multimedia. This provides automatic right for protecting any original creation, which is not in need of registration but with limited time. There is no need to seek lawyer's help foi settlement.

Protection to copy right does not give any procedure, principle, concept or method of operation, regardless of the format in which it is explained. In other words protection of copyright is limited to an inventor's particular expression of an idea, concepts or process in a tangible medium. Copy right is sanctioned to prevent others from:

a) copying the work
b) publishing and selling copies commercially
c) renting or lending the work in open market
d) performing or demonstrating the work in public

The TRIPS agreement provides a minimum duration of copyright protection to the tune of the life of the inventor or author plus 50 years. Anyhow rights granted exclusively to the copy right owner may permit others in making fair use of the owner's work, like for the purpose of review, comment, reporting, teaching, researches, etc. Of course, the impact of copying an inventor's work's commercial value is considered to know whether the copying is for "fair use". To secure protection for copy right, the particular work must be an original work made or written in a tangible medium of expression. The test for such originality consists of two conditions. First, work must originate from the inventor and not a copy from others' works. Next, the invention or work must have sufficient amount of creativity. Moreover the work must be fixed in a "tangible medium of expression".

Trade marks

Trademark is for broad identity of specific goods and services permitting differences to be made among different trades. This is a territorial right, which needs registration, but without any time limit. Lawyer is needed for guidelines. It is better to have some sort of lack of confusion with other trade marks.

Trade marks are basically intended to indicate clearly the source of any sign or combination of signs of goods. Some times this is called as service marks to point out the

source of services so as to distinguish one service from others. These marks also symbolize distinctly the quality of the goods or the services. These marks are in the form of certain 'wordings', which differentiate any one product or service from another one. These can be in the format of logos, designs, sounds, symbols, etc.

The TRIPS agreement provides the same type of protection for trademarks. Registration of these marks is issued for definite period of time. However, in order to avoid public confusion, encourage competitions and protect the inventor's good will, the registration may be renewed. With reference to intellectual property area, trade marks are national in origin and should comply with provision of TRIPS agreement. These marks should be distinctive or in other words, it should be capable of distinguishing the goods or services of one inventor from that of others.

The Engineer should be clear about Trademarks, legislation or other terms. Normally, a mark's strength is usually expressed across a spectrum. The terms that are normally used *for* trademarks are generic, descriptive and suggestive. These spectrums include the above said terms from the weakest end to the strongest end. Words, symbols or devices that are not so distinctly distinguishing the goods from others are at the weakest ends, as they are common terms used to identify the goods themselves. These are termed as generic terms and are not protectable as trademarks.

But the descriptive terms clearly indicate or inform the specific purpose, functions, physical characteristic and end use of the product. But comparatively the suggestive marks do not at a glance describe the goods for which the mark is used; yet they rather require some imagination or perception to arrive at a conclusion about the nature of the goods. Suggestive marks are inherently distinctive and protectable.

The other type of trademarks include arbitrary marks and fanciful marks which are inherently distinctive.

Trade secrets

A trade secret means information, which is kept confidential as a secret. This is generally not known in the relevant industry, providing an advantage to its owner over other competitors. Unlike other types of Intellectual property, this trade secret is fundamentally a "do it yourself" form of protection. For engineers, inventors, and designers, the trade secrets are to be maintained secretly. Such trade secrets include some formulae, methods, programs, processes or data collections etc. If there is any improper disclosure or use of the trade secret by another persons, the engineer or inventor may claim and recover damages resulting from illegal use.

The trade secrets are not normally registered like other types of intellectual property. The information of the trades is simply kept confidential. The protection covers as long as the secret is kept confidential. Once the trade secret is made open to the public, its protection ends. International theft of trade secrets may constitute a crime and under both the state and federal laws.

TRIPS agreements provide the protection for trade secrets under the heading 'protection of undisclosed information'. The engineer in competitive field should feel their responsibility and status while making use of such trade secrets till its disclosure. If the information of a trade secret is available through any legitimate means and **if** any engineer or any different inventor is responsible illegally for such leaking, then the trade secret may become ineligible for protection.

Enforcement of Intellectual Property Rights are definitely private rights **.If** any one uses the material without the inventors' permission, the I.P right owners can use any remedies available under the civil law .It is always better to make sure that the inventor bring the existence of I.P to others' notice in some sort of dealings with them, so as to reduce the channels of others using the specific I.P. If any I.P rights are purposely used illegally on a commercial scale, the owner can seek legal actions under the criminal offence. But the particular circumstances need to be studied carefully to find out whether such illegal actions amount to a criminal offence (or) is it an issue that can be solved with the help of a civil law.

Need for protection to ipr

The protection of intellectual property rights is an essential element of economic policy for any nation. Only such protection can stimulate research, creativity and technological innovations by giving freedom to individual inventor and companies to gain the benefits of their creative efforts.

It is a very important issue to plan to protect the intellectual property rights. The main needs are to

a) Prevent plagiarism
b) Prevent others using it
c) Prevent using it for financial gain
d) Fulfill obligation to funding agency
e) Support income generation strategy

importance of ipr

The intellectual property rights are granted to the inventors for their freedom for other creation. These rights are very important, as they

a) give the inventors exclusive rights of dealing
b) permit avoiding of competitors and raise entry barriers
c) permit entry to a technical market
d) generate steady income by issuing license

4.How is occupational crime motivated in industrial scenes and explain the conflict and crime in price fixing with suitable example?

Occupational crimes are the illegal acts that are made possible through a person's lawful employment It is a secret violation of laws which rules the work activities. When these types of crimes are carried out by office workers and professionals, it is known as white collar crimes.

Most of the occupational crimes *are* the special examples of conflicts of interest. These kinds of crimes are motivated by personal greed, corporate ambition, misguided company loyalty etc. The crimes which are done for promoting the interest of the employers are also called occupational crimes. Another form of occupational crime is employee theft ,when it is joined with an employee's assigned jobs. Recently penalties are enforced to provide discouragement for individuals with low level ethical motivation.

Following case studies are some of the examples of occupational crimes. They also express further exploration of professionalism, loyalty, conflicts of interest and confidentiality.

1. Industrial Espionage

Industrial espionage means industrial spying. In northern California, one industrial area is famous for computer industries. These industries engage it the main production function of integrated circuit microprocessors or computer chips. This area has a large number of creative engineers and entrepreneurs. It also has a large number of industrial espionages. The reasons for such a large industrial espionage particularly in that area are as follows:

1. The development of computer chips is extremely competitive and fast moving. The products are often outdated within two years, because of the introduction of new chips. Profits or loss can be made in months, depending on the development and marketing of new products.
2. Manufacture of computer chips is the most expensive one. Large savings can be made only by adopting reverse engineering. This can be adjusted by breaking the competitor's device either mentally, physically or by tests. The device is then reconstructed to produce an identical or better device that can be offered at a lower price because of the low development costs. Large savings are also made by acquiring the design information of the competitors by illegal ways.
3. By nature, computer chips and its parts are very small. So they can be easily taken away from the offices by secret means. The chances of being caught are also little.
4. The enforcement of law has been ineffective. Most of the crimes are not taken to Police. When the white collar criminals are convicted, they will be given only less punishments.
5. Employees who are revealing secrets won't be carrying out such activities directly. There are some agents who buy the secrets of one company and sell them to other competitors. Here we have a study example:

Peter Gopal, who was an expert in semiconductor worked for a number of computer chip companies in that area, before starting his own consulting company. As he was very familiar to that area, he made a vast number of contacts which enabled him to buy and sell the secrets of competitors.

Out of such contacts James, who was a skilled electronics draftsman, worked for Gopal on a moonlighting basis in addition to his igular job at a company named National Semiconductor Corporation. Gopal lent James a moderate amount for the construction work of his house. Gopal asked James to repay the loan not in cash but with documents stolen from NSC. James did this for Gopal in return.

Gopal sold NSC secrets to another company, named Intel corporation. He had also stolen from Intel and sold them to NSC. Intel has got a very tight security systems. But Gopal knew that most of the manufacturing materials of Intel were stored at an Intel Sub-contractor, named NBK, which has no such securities. NBK uses chip 'recites' and data tapes to store the materials. Gopal purchased copies of recites and data types from a supervisor at NBK.

As a result of the above, all the companies in that industrial area suffered by high employee turnover rates because of opportunities for advancement.

NSC, Intel and Police conducted an under cover operation and finally captured Gopal. He had been a spy fo.r more than ten years.

2. Price Fixing

The American Government passed the Shorman Antitrust Act in the year 1890, to stop the companies from jointly setting prices. During that period the price fixation was done by companies in a joint manner. It has held back free competition and trade. After this Act, was passed often it had been violated in the electrical equipment industry where there were large contracts but only few competitors.

The most famous violators case of the Act had happened in two electric companies named as Westing House and General Electric. Top officials of these two companies and some other manufactures were caught for their involvement in price fixation without the knowledge of their proprietors. All the companies were fined a large amount and the persons involved in that were sentenced to imprisonment.

How they fixed the price was an interesting story. They allocated bids on the basis of the previous market shares of their companies. A company with 20% of the market share, would be allowed to submit the lowest bid for 20% of the new contracts. But they would not be given the contracts. The contracts were assigned on the basis of a rotating-plan which had a code-name as "phase of the moon".

The persons who participated in the price fixing game were highly reputed officials of their companies and in their communities. One of the persons was the president of the local Chamber of Commerce. What made them to do such illegal activities?

The answer was, they did not consider their activities as crime or harmful. Many of them argued that their conduct was beneficial. They also argued that fixation of price was of benefit to the public by stabilizing the prices. This crime of price fixing had been spread over the industries for a long period of time.

3. Endangering Lives

Employers who expose their employees to safety hazards usually escape from criminal penalties. Victims can sue the companies under the civil law, which makes them to get monetary compensation only. The companies which are responsible for the death of people can easily escape by paying compensation.

For example, in the Asbestos industry, asbestos fibers cause a lung disease named 'asbestosis' and an incurable cancer disease named 'mesothelioma'. In America, during 1940-1979, more than ***25*** million asbestos workers were found to be affected by such

diseases; and more than l,00,000'workers dead.

The victims and their families filed suits against the asbestos companies for damages, seeking only monetary compensation and not criminal justice. In order to postpone the settlement, most of the industries filed for protection under bankruptcy. A court agreement was made that the companies could continue their operations by paying a large amount as compensation over the next *25* years. Thus they escaped from the criminal case against the death of one lakh people and also they were allowed to continue their business by the court. The reason here is that the cases are filed only for monetary compensation for settlement.

5. Under what circumstances the conflict of interest occurs with the employers?

A conflict of interest occurs when the employees have an interest to pursue. It may prevent them from meeting their obligations to serve the interest of their employers or clients. For example, an electronics engineer working for a state department of communications might have a financial interest in a company which has a bid on supply of instruments. If that engineer has some responsibilities for determining which company's bid to accept, then there is a clear conflict of interest. Pursuing his financial interest in the company might lead him not to objectively and faithfully discharge his professional duties to his employer, the communications department. This kind of conflict must be avoided very carefully.

Types of conflicts of interest:

1. Actual conflict of interest

It is based on weaker judgment and service. It refers to the loss of objectivity in decision making and inability to faithfully discharge professional duties to employer. For example, an engineer may have financial interest or returns in the company, the suitability of which he has to judge for procurement of materials or any specific contract as the case may be

There are so many varieties of possible outside interests to the engineer. So, conflicts of interest can arise in so many ways. To identify conflicts of interest, the general test is, whether there is any possibility of an outside interest influencing a professional's judgment or the judgment of an professional in serving employer or clients.

2. Potential conflicts of Interest

It is based on the difference between gifts and bribes. Conflicts of interest threaten good judgement of an employer or a client for faithful service. For example, as engineer may find himself becoming a friend gradually with a supplier for his company. Although this situation does not constitute any conflict, there is a chance that the engineer's judgment might become conflicted in order to maintain the friendship with that supplier.

This kind of potential conflicts also arise when accepting large gifts from the suppliers. To understand clearly first we should understand the difference between a bribe and a gift.

A bribe is a large amount of money or substantial goods offered with the aim of gaining the contract. Another form of bribing is 'kick backs'. Prearranged payments made in exchange for contracts actually granted are known as 'kickbacks'. Bribes are said to be illegal and immoral.

Gifts are not bribes, because they are worth a small amount of money given for the services rendered in the normal conduct of business. These kinds of gratuities are unobjectionable. In the past the following rule of thumb was often applied. "A gift is a bribe if one can't eat, drink or smoke it in a day". Today a more appropriate rule of thumb would say: "If you think that your offer of a particular gift would have grave or merely

embarrassing consequences for the company if made public, then the gift should be considered a bribe".

As per codes of ethics, engineers shall not accept even gratuities, directly or indirectly, from contractors, their agents, or other parties dealing with their clients or employers in connection with work they are responsible or bound to do.

3. Apparent conflict of Interest

Apparent conflict of interest may occur, when an engineer is paid based on a percentage of the cost of the design and there is no incentive for him to cut costs. In this situation, it appears that the engineer is making the design more expensive in order to make a large commission for himself. The distrust caused by this situation compromises the engineer's ability to do this and future work and leads to a situation for questioning his judgment.

There are some other forms of conflicts of interest. They are as follows:

1. Interest in other companies

This kind of conflict of interest consists of having an interest in the business of a competitor or a sub-contractor. For example, working as an employee or consultant for the competitor or sub-contractor, and partial ownership or large stock holding in the business of competitors.

Holding a few shares of competitor's business will not create conflict of interest, but when the number of stock holdings increases it will create a conflict of interest. Likewise, if the wife of a person works for a sub-contractor, there will not be any form of conflict of interest, but at the same time, a conflict of interest arises if that person grants contracts to that sub-contractor. This kind of outside interest may be possible when an engineer prepares to leave a company in order to form his own company to compete with the former company, where he worked.

2. Moonlighting

It deals with a person who is working in two companies. This will break the rights **l** to pursue a person's self-interest. Moonlighting will produce the conflict of interests only when a person is working for competitors, suppliers or even customers. A special kind of conflict of interest exists when moonlighting make one person exhausted and there by affecting the job performance of that person.

3. Insider information

It is a kind of sensitive conflict of interest which consists of using "inside" information to make an advantage or to start a new business opportunity for onesel one's family or one's friends. The information may be of a person's own company or another company with which he does business.

For example, holding stocks of the company in which a person works will not be objectionable. But that ownership must be based on the same information available to general shareholders of the company and not more than that.

Thus the use of company's secrets by its employees to get a personal benefit is always dangerous in the interest of the company and will create a conflict of interest between the employer and employee.

Avoiding conflicts of interests

All types of conflicts of interest should be avoided in a careful manner. The following are some of the ways to avoid conflict of interest.

i) A best way is to follow the guidance from a company's policy.
ii) In the absence of such policy, taking a second opinion from a subordinate or co-worker or even the manager. This gives an impression that there is no intention on the part of the person to hide anything.
iii) In the absence of the above two ways, it is better to examine one's own motives and use ethical problem solving techniques.
iv) Of all the above, one can carefully look into the statement of professional codes of ethics, which uniformly refuse to allow conflicts of interest. Some of these codes have very explicit statements which help to determine whether a situation is a part of conflicts of interest or not.

6. Discuss the functions and relationship of expert authority with Institutional authority?

Engineers, who work for companies have obligations to respect the legitimate authority of their employers, in order to fulfill the organizational aims. Hence, authority is a must. Authority provides a way for identifying the areas of personal responsibility and accountability.

(1) Institutional Authority

This refers to the authority within the organization. It is the right of employers and managers to exercise their power on employees and to force them to achieve their institutional goals. In other words it is the institutional right given to a person to exercise power which is mainly based on the resources of the institution. In order to enable the mangers to carryout some duties such as allocating resources properly, making policy decisions, giving recommendations, looking after the project, issuing orders or directions to subordinates, they should be empowered to act as authorities.

When the authority is given to the qualified individuals by the organizations the goals can be achieved easily. At the same time, the authority granted and the needed qualifications for exercising that authority will not match with one another. In most of the organizations, incompetence to execute authority is found.

(ii) Expert Authority

For avoiding the problems in institutional authority (i.e. incompetence), Expert Authority comes into existence. It is the possession of special knowledge, skill or competence to perform a given job in a better way or to give beneficial advice regarding a job. For example, doctors are the authorities on health, computer professionals are the authorities on software and hardware etc. This authority is also known as 'authority of leadership' i.e., the power to direct others in an effective manner.

Engineers are said to have the expert authority on projects in which they have no institutional authority to take proper decisions. In most of the companies, expert authority is rested with the staff engineers, advisers and consultants while the institutional authority is given to the line managers.

When the institutional authority is given to ineffective persons, they will be unable to exercise that authority due to lack of power to inspire and encourage the employees to achieve organizational goals. But, effective people, who are given only institutional authority may acquire greater power or competence to motivate the employees. So, the authority must be given to those who get power or competence on the employees. Then only it will be beneficial to the institutions.

An employer may have the institutional authority to direct engineers to do something that is not morally justified. The engineers may have the institutional duty to obey the employer to do morally unjustified things. So, institutional rights and duties cannot be applied in the same sense with rights and duties that are morally justified.

The institutional authority is morally-justified, only when the goals of the institution are morally permissible or morally desirable and the way in which it is exercised does not violate other moral duties.

Accepting Authority

Employees acknowledge their employer's authority by accepting the guidance and obeying the instructions given by the employer in their activities that are covered by the employer's institutional authority.

Whenever subordinates simply adjust their behavior as guided by the decision of a superior, without analyzing the facts and advantages of that decision, then they are said to be accepting the authority. But at the same time they should not forget to analyse critically the instruction of the employer in order to behave morally. They should look the justified extent of their "zone of acceptance" of employers authority.

An engineer should not forget his important obligation to protect the public health, safety and welfare. It should be given primary importance than obeying the employer's institutional authority

7.On what possible ways and means the people are discriminated in general.

Discrimination can be interpreted in several ways. Discrimination means to make an unfair difference in one's treatment of people. It also means giving preference on the basis of sex, race, religion etc. In other words it can also be explained morally unjustified treatment of people on random or irrelevant basis. It is a kind of "reverse preferential treatment". Reverse preferential treatment means one who gives different treatments to equal standard of two different groups.

The following are some of the examples of discrimination.

(i)In a large automobile company a vacancy arises for the post of AGM. Generally these positions are filled by the virtue of promotion from the existing seniors within the company. As per the rules, the management has to make a review among the employees. The members find one suitable person who has lot of experience and training in the company. Unfortunately, the selected person does not belong to the community of the majority people of the company. The management fears if the person is given appointment there may be less employees' cooperation for smooth running of the company. So the management decides to promote and transfer another person who belongs to the same community of the majority from another plant.

(ii) A company has appointed more number of women engineers in its sales division. But their pay is not at par with that of men.

(iii) Due to low economic activities, a company has to face the problem of less sales. In order to overcome, this problem the management decided to send out some engineers who are in the verge of retirement within 10 years.

Anti discrimination laws

In our country discrimination against women is controlled by many of the Laws such as Factories Act, Labor Laws, Acts relating to wages etc.

In U.S, the discrimination of public as well as private employers is prohibited legally under the civil Rights Act of 1964, the equal employment opportunity Act of 1972 etc. These acts protect the weaker, minorities and women from discrimination by race, color, religion, sex or national origin. The age discrimination is also prohibited by age discrimination in employment Act of 1967.

Preferential treatments

Preferential treatment means giving preference for the minorities and women in employment opportunities.

(i) Weak Preferential Treatment

It implies giving **a** benefit or preference to the members of traditionally discriminated against groups over equally qualified applicants who are the members of other groups.

(ii) Strong Preferential Treatment

Strong Preferential Treatment involves giving preference to women and minority applicant over better-qualified applicants from the other groups.

It shall be an unlawful employment practice for any employer, labor organization or joint labor-management committee controlling apprenticeship or other training or retraining including on-the-job training programs, to discriminate against any individual because of his race, color, religion, sex, or national origin, in admission to, or employment in, any program established to provide apprenticeship or other training.

Arguments Favoring Strong Preferential treatment

(i) As per right-ethics, preferential treatment stresses the compensatory justice principle i.e., violations of rights must be compensated. For example, the properties taken from others in the past, even if it is very minimal, must be returned. In the same way, members of groups who have suffered job discrimination in the past must be given special advantages in getting jobs today.

(ii) As per the utilitarian principle, the economic and social activities are more important for women and minorities. This can be only achieved by preferential treatment. This has to be done in order to achieve harmony between races and sexes.

Arguments against Strong preferential Treatment

(i) This type of preference is a direct violation of the rights of others people in acquiring equal opportunity.

(ii) Giving such preferences involves larger compensation to the minorities and women.

So, the arguments for and against such treatment, points out the right to equal employment opportunity, the right to receive and the duty to give compensation for past discriminations. These are the best ways to achieve social integration.

It means continuous annoying and attacks on women on the basis of sexual considerations. It also covers the harassment by female superiors of the male employees and sexual harassment of employees by superiors of the same sex,

Sexual harassment includes physical and psychological attacks, coercion, misuse of authority and a variety of undesirable and indecent actions.

In short, Sexual Harassment may be defined as

(i) when applied to women, "any sexual oriented practice which endangers a woman's job, that undermines her job performance and threatens her economic livelihood."

(ii) "It is the unwanted imposition of sexual requirements in the context of relationship of unequal power".

In the field of engineering, the woman may be an engineer, a technician, or secretary and the male who harasses the women may be her manager or her colleague.

Forms of Sexual Harassment

(i) In an interview for the post of a secretary a woman is told that the job will be given to her only when she is ready to give sexual favors to the interviewer.

(ii) A woman is told by her superior that she will be given first priority for receiving a promotion if she is ready to "adjust" him by means of sexual contacts. When she refuses to do so, she is not given promotion and is assigned less category of job.

(iii) Against her desire, a woman is grabbed and kissed by her employer, who had asked her to stay after office hours. She refused to do so and then she has been scolded heavily on the next day by him.

(iv) A women refuses her superior's request for a 'dating'. She also makes it clear *that* she is not interested in going out with him ever, but he continuously insists on do the same.

(v) A male colleague of a woman continuously looks at her and makes sexual comment and suggestions about her dress and body.

(vi) A male engineer enjoys telling unwanted sex jokes to his secretary who is not interested to listen.

So, sexual harassment may be in the form of threats of penalties, offers of rewards, assaults and annoyance.

Sexual harassment may take place anywhere, such as work place, public place, schools, colleges etc. In a work place it involves lowering the economic status of women. It is an assault on the dignity of the victim.

A duty-ethicist gives a strong disapproval of the sexual harassment. It is the duty of the co-workers to treat women in proper manner with due respect. An utilitarian argues that it spoils the happiness and self-fulfillment of the victims.

8.Briefly Explain Employee Rights?

Employee rights are any rights, moral or legal which refer to the status of being an employee. These rights include some of the professional rights such as the right to disobey the unethical instructions and the rights to express their dissatisfaction on the company policies without any bad effects from the side of the employer. It also implies all the basic human rights which are reasonable to the situation of employment such as the right of not to be discriminated against.

Employee rights also have the institutional rights which arise safely out of an employee's contracts created by organizational policies or contracts. These rights are known an "Contractual Employee Rights". The rights to receive a salary of a certain amount, right to receive some company's benefits such as periodic increments in the pay and profits sharing etc, are some examples of contractual employee rights.

Another form of employee's rights are called. "Non Contractual Employee Rights." These are the rights that occur even if not formally recognized in the specific contracts or company policies. These rights include right to choose outside activities, right to employer confidentiality, right to due process from employer and right to non discrimination and absence of sexual harassment at the work place.

Choice of outside activities

As per this right, all the employees can engage in non-work or outside activities of their own choice without any compulsion or deserved punishment from their employers. This right is also a part of the human right of employees to attain legitimate interests without any interference from the employers. But there may be some bad violations of this right as it has not been protected by any law. For example, an employer can scold heavily or threaten his employee when he tries to engage in outside activities and also an employer can slash out or fire by words his employee when he does some activities which harm the image of the company.

In order to protect the public image, an institution can put some limits on the right of the employees to engage in outside activities. They are as follows

When the outside activities of employees lead to violating or detriment to the duties of their job, then the rights of employees to engage in outside activities become limited. For example, an employee has a right to smoke, but not in work place which is supposed to be a pleasant and safe work environment for other employees.

(ii) When the outside activities of employees form a conflict of interest, then employers have the right to take action against the employees. For example, stop an employee from moon lighting.

(iii) Employees have no right to damage their employer's interest outside the office-hours.

PRIVACY

Right to privacy of employees means the right to stop access to and use of information about oneself i.e., the employers should not interfere into the private life of the

employees. This right is also limited in certain cases by employer's rights. The following examples will show how the function of employers conflict with the right of privacy of employees.

i) Before hiring an employee for the post of cashier, the employer can ask questions about their criminal records.

ii) Before appointing a person in the sales department the employer should conduct personality test which includes knowing whether he uses drinks (alcohol) and sexual contact in an illegal manner.

iii) A supervisor can unlock and search the table of his subordinate without his permission when he had doubts about his trust - worthiness.

iv) In order to avoid theft, employer has the right to fix hidden cameras in the work place.

Some of the above said examples sometimes may be misused by the employers in order to manage the company effectively. This unwanted interference of the employers is said to be morally problematic and need some kind of justifications.

For example, a company may stick tiny microphones on the identity cards of its employees without telling them, so that the employer will be able to hear what they talk and where they are. This activity upsets the employees and the employees would object to the tricks made by the employer. But at the same time, if they are fully informed about the device at the time of their appointment that the device is to be used as a condition of employment, the employees may not be in a position to object.

An utilitarian will answer that such activity would make the worker unhappy and it would lead to a general anxiety among the employees. Their conversational flow would be affected. The use of such device would ruin the trust of the employer. It would also lead to some kind of harassments.

A duty ethicist argues that this kind of activity breaks the duty to respect the people and demoralize them. The intimate relationships may be affected and also that the personal freedom of employees may be affected.

So, the right to privacy is limited by the legitimate actions of employers' to obtain and use information of employees only for effective management of the company. But this information should not be given to outsiders. Then only the trust relationship between employer and employee can be maintained.

Right to due Process

It is the right to fair procedures which helps to safeguard the exercise of other rights. This right offers fair procedures in firing *I* slashing, demotion and taking disciplinary actions, There are two procedures in implementing the right to due process.

i) Written explanations should be given to employees who are discharged, demoted or transferred. The reasons for their punishments should be clearly informed to them in a written format.

ii) An appeal procedure should be established and should be made available to all employees who believe that their rights have been violated. This procedure should be simple and easy to use and work quickly.

Government employees and labor union members have this procedures. In case of private companies, they establish their own procedures.

UNIT V

GLOBAL ISSUES

1.What are the duties of an engineer in his role as experimenter?What sort of queries should respond?

Environment is common for all of us. Now there is a great and urgent need for awareness to take care of the environment as a united commitment even across the national boundary. Hence it is essential for us to learn. 'Environmental Ethics'. Environmental ethics forbids the activities of people deteriorating the surroundings of environment in so many ways. For persons who are really interested in maintaining their environment with great affection, respect and regard, it is better to learn ethics. It is a well known fact that we are misusing our major resources, there by spoiling the environment. More over it is a well-agreed fact that industrial activities mainly affect the biosphere, polluting water and atmosphere. But to what extent the pollution damages the environment and how and what countermotions we are going to take are some unanswerable questions. Environmental ethics educates us that we should leave a habitable world for our future generation.

The pessimist apprehends that man is egoist and has short sighted views. Man has destroyed the ço-system by his ignorance or apathy. If this condition continues one day or other, the entire system will collapse, leading to an end of life, either of a people or the earth. But fortunately, man kind has realized the seriousness and ecological responsibilities well in time. The awareness and knowledge growth are taking place at an exponential rate. All intelligent and media people have started to show a lot of interest for the environmental protection. Of course some strict legislative measures are also to be taken. The public awareness and approaches against such anti-ecological attitudes are developed accordingly to curb the anti-environmental activities. So every technical person has to think and plan with a feeling that our environment and natural resources are to be preserved and not to be degraded unrepairable.

ENVIRONMENTAL CONCERN TO ENGINEER

Engineers in particular must be aware of their roles as experimenters. In any industrial planning or setting up an industrial scheme, every engineer should ask himself the following questions.

i) How does an industry affect the environment?
ii) How far such ill effects, if any, can be controlled? Is physical or political regularization needed?
iii) Are reasonable protective measures available for immediate implementation?
iv) Can the engineer as an individual ensure safe and clean environment?
Some of the serious environmental issues of concern to engineers are as follows;

1) Releasing harmful substance into water and air
ii) Using toxic substance in food processing
iii) Disturbing land and water balances

Disasters Affecting Environment

Though numerous accidents and disasters have taken place in the world, some of them and their related tragedies are still in the mind of the people. To quote some case studies, Bhopal gas tragedy, Chernobyl nuclear plant explosion, Artificial rains, Meuse valley disaster at Belgium, Oleum gas leak in Delhi, HPCL disaster in Vizag, Donova (USA) steel and chemical plant disaster, Tehri Dam in U.P. State, etc.

ACID RAIN

Industries and thermal power plants release innumerable quantities of nitrogen oxide and sulphur every day. These gases react with the atmospheric moisture thereby forming nitrates, sulfates, nitric acid and sulfuric acid droplets. These compounds emitting at a particular place may be transmitted even hundred kilometers downstream and may be deposited on ground and vegetation lands, directly as 'Acid rains'. Everybody knows1 that rain is the purest water, but Acid rain' refers to any precipitated or suspended particles, snow, dew etc., which are acidic. As mentioned Acid rain is mostly due to emission of SOx to an extent of 70% and due to NOx emission to an extent of 30%. Acid rain is dangerous to men, materials, and vegetation. This may entirely disturb the ecologça1 balances globally. The environmental world wide usage of fossil fuel by different industrial nations buildup a screen of carbon-di-oxide in the atmosphere, resulting in a greenhouse effect very seriously damaging the entire earth. Similarly the other notable causes of acid rain are mainly due to the release of freon from technological products damaging the protective ozone layer of the earth's atmosphere.

Effects of Acid Rain

1) Bacterias that are essential for life systems to be active are killed.
ii) High acidity results in reduced growth and killing of fishes.
iii) Accumulation of organic matter in lake and streams increases the degree of water pollution.
iv) Concentration of heavy particles like copper, zinc, lead, and manganese are increased in water.
v) Germination of seeds is affected affecting the growth of trees.
vi) Vanishing of greenery and destruction of forests:
vii) Affecting of the soil by decreasing its fertility: beneficial microorganisms are reduced.
viii) 'Stone cancer' or 'Stone leprosy' are due to acid rain..

Other similar pollutions are due to Asbestos in air and drinking water, and release of mercury, cadmium and PCB (in Japan).

ETHICAL PROBLEMS AND ITS ISSUES

In our country, increase of population and decrease of natural resources like air, lands, forests, lakes and oceans have very serious environmental ill effects. Apart from voluntary conservation efforts, a shared effort to exercise democratic and international controls is most essential. Democratic controls include establishing rules and norms, stringent legislation, control equipment, and assessment of the technology applied in the approved projects.

Often the questions that arise in this sort of ethical issues are: -

Who is affecting? Who are affected? Does the environment get disturbed'? When does

the disturbance take place? And how does it happen?

Engineers are supposed to have full confidence in their respective projects. They would have to be very careful to foresee the entire environmental effects of their project or work in advance. They have to plan themselves how to control those consequences without further or frequent redesigns, with an idea of considering engineering as experimentation. They must have forethought and budget of fund release for the 'safe exits' and subsequent corrective measures as the case may be. But there is a risk in having faith and belief that no further action is required once the project reports have been approved. Engineer's contention must remain still that engineering should be understood as social experimentation and still the experiment must be continued.

Among human centered environmental ethics, 'virtual ethics' have drawn attention to humility, appreciation of beauty, love, and affection and gratitude towards the world of nature. 'Right ethics' stresses that the fundamental right to life enforces a right for livable environment in a particular period of time, when pollution and depletion of resources has reached a dangerous proportion. Utilitarians deeply stress that human pleasures and self interests are linked to nature in so many ways apart from the stage the engineering products are produced from natural resources. Ethics stress the people should have aesthetic interest and survival interest to preserve the natural environment.

2.Explain computer ethics with examples?

No matter which re-definition of computer ethics one chooses, the best way to understand the nature of the field is through some representative examples of the issues and problems that have attracted research and scholarship. Consider, for example, the following topics:

1. Computers in the Workplace
2. Computer Crime
3. Privacy and Anonymity
4. Intellectual Property
5. Professional Responsibility
6. Globalization

1. Computer in the Workplace

As a "universal tool" that can, in principle, perform almost any task, computers obviously pose a threat to jobs. At the same time, computers are often far more efficient than humans in performing many tasks. Therefore, economic incentives to replace humans with computerized devices are very high. Indeed, in the industrialized world many workers already have been replaced by computerized devices.

The employment outlook, however, is not all bad. Consider, for example, the fact that the computer industry already has generated a wide variety of new jobs: hardware engineers, software engineers, systems analysts, webmasters, information technology teachers, computer sales clerks, and so on. Thus it appears that, in the short run, computer-generated unemployment will be an important social problem; but in the long run, information technology will create many more jobs than it eliminates.

Another workplace issue concerns health and safety When information technology is introduced into a workplace, it is important to consider likely impacts upon health and job satisfaction of workers who will use it.

2. Computer Crime

In this era of computer 'viruses" and international spying by "hackers" who are thousands of miles away, it is clear that computer security is a topic of concern in the field of Computer Ethics. The problem is not so much the physical security of the hardware, but rather "logical security", which can be divided into five aspects:

1. Privacy and confidentiality.
2. Integrity- assuring that data and programs are not modified without proper authority.
3. Unimpaired service.
4. Consistency- ensuring that the data and behavior will be the same ever.
5. Controlling access to resources.

Computer crimes, such as embezzlement or planting of logic bombs, are normally committed by trusted personnel who have permission to use the computer system. Computer security, therefore, must also be concerned with the actions of trusted computer users.

Another major risk to computer security is the so-called "hacker" who breaks into someone's computer system without permission. Some hackers intentionally steal data or commit vandalism, while others merely "explore" the system to see how it works and what files it contains. Even if the hacker did not make any changes, the computer's owner must run through a costly and time-consuming investigation of the compromised system

3. Privacy and Anonymity

In the early 1 970s, major computer privacy laws were passed in the USA. Ever since then, computer-threatened privacy has remained as a topic of public concern. The ease and efficiency with which computers and computer networks can be used to gather, store, search, compare, retrieve and share personal information make computer technology especially threatening to anyone who wishes to keep various kinds of "sensitive" information out of the public domain or out of the hands of those who are perceived as potential threats.

It is more difficult to protect privacy in computer, as large amount of data on individuals and companies are stored centrally. Moreover many numbers of other individuals can easily access them. Privacy is meant as the basic right of an individual to control access to the information about himself. This is an ethical issue. Invasion of privacy is harmful for the following ethical reasons.

1. Leakage of personal information can lead to mental harassment or blackmailing
2. Personal information is considered as a personal property. Any unauthorized use of such information is a theft.

Questions of anonymity on the internet are sometimes discussed in the same context with questions of privacy and the internet, because anonymity can provide many of the same benefits as privacy. For example, if someone is using the internet to obtain medical or psychological counseling, or to discuss sensitive topics (for example, AIDS, abortion, gay rights, venereal disease, political dissent.), anonymity can afford protection similar to that of privacy. Similarly, both anonymity and privacy on the internet can be helpful in preserving human values such as security, mental health, self fulfillment and peace of mind. Unfortunately, privacy and anonymity also can be exploited to facilitate unwanted and

undesirable computer-aided activities in cyberspace, such as money laundering, drug trading, terrorism, or preying upon the vulnerable.

4.Intellectual Property

One of the more controversial areas of computer ethics concerns the intellectual property rights connected with software ownership. Some people believe that software ownership should not be allowed at all. They claim that all information should be free, and all programs should be available for copying, studying and modifying by anyone who wishes to do so. Some would argue that software companies or programmers would not invest weeks and months of work and significant funds in the development of software if they could not get the investment back in the form of license fees or sales.

A very controversial issue today is a patent on a computer algorithm. A patent provides an exclusive monopoly on the use of the patented item, so the owner of an algorithm can deny others use of the mathematical formulas that are part of the algorithm. Mathematicians and scientists are outraged, claiming that algorithm patents effectively remove parts of mathematics from the public domain, and thereby threaten to cripple science.

5. Professional Responsibility

Computer professionals find themselves in a variety of professional relationship with other people, as

employer — employee
client — professional
professional — professional
society — professional

These relationships involve a diversity of interests, and sometimes these interests can come into conflict with each other. Responsible computer professionals, therefore, will be aware of possible conflicts of interest and try to avoid them.

In order to take proper decision on the computer related ethical issues, many of the companies and organizations have established computer codes of ethics for proper use of computer. Professional organizations in the USA, like the Association for Computing Machinery (ACM) and the Institute of Electrical and Electronics Engineering (IEEE), have established codes of ethics, curriculum guidelines and accreditation requirements to help computer professionals understand and manage ethical responsibilities.

6. Globalization

Global Laws

Computer ethics today is rapidly evolving into a broader and even more important field, which might reasonably be called "global information ethics". If any one wish to protect their freedom of speech on the internet, there are no special laws available to guard them. Nearly two hundred countries are interlinked by the internet. Though there *may* be *a* specific law in United States Constitution, it is just a 'local law' on the internet. It does not apply to the rest of the world. While so many countries are involved, issues like freedom of speech, protection of intellectual property rights, invasions of privacy and many others are to be governed by some laws.

Global Cyber business

The world is very close to having technology that can provide electronic privacy and security on the internet sufficient to safely conduct international business transactions. Once this

technology is in place, there will be a rapid expansion of global "cyber business" Accepted business practices in one part of the world be perceived as "cheating: or "fraud" in other parts of the world.

Global Education

If inexpensive access to the global information net is provided to rich and poor alike, to poverty stricken people in ghettos, to poor nations in the "third world", etc. for the first time in history, nearly everyone on earth will have access to daily news from a free press; to texts, documents and art works from great libraries and museums of the world; As great universities of the world would begin to offer degrees and knowledge modules via the internet, will 'lesser' University be damaged or even forced out of business?

PROFESSIONAL ISSUES

The use of computers creates some professional issues. Sometimes, it will make the job more complex and involve high degree of technical proficiency.

i) Computer Failures

Failure of computers can occur due to the errors in hardware and software. Hardware errors will not occur frequently and they can be solved easily. But software errors are very serious as they destroy the entire network.

ii) Computer Implementation

While creating a new computer system, the old system should not be avoided. The old system should still be in operation

iii) Health conditions

While supervising computer personnel and designing computer terminals, the engineers should check that whether there are enough facilities made available to reduce the back problems, to provide wrist support and proper keyboard layout and to offer proper lighting and flicker control.

3.Discuss in short the interlink between 'Technology and war'?

The technological activities of the world are centered on the Military. The engineers are supposed to get involved in the development of the Military weapons either directly or indirectly.

The reasons for an engineer to do his best on a military job are patriotism and interest in the future. But, the same engineers may refuse war work, because unethical activities such as manufacture of devices or weapons, kill the human beings and the innocent civilians

While forming the forms of weaponry, the engineers have to examine their own interest and also to consider the political circumstances.

Engineers have the ethical obligations to design bridges, which do not collapse while using, and nuclear power plants, which do not emit radiations. While involving in the above said activities, they must consider the results, which will arise from their participation in these activities.

Business, relating to weapon and military skill has been in long run in the world for a long period of time and still going on. Every country is spending a large amount only on its military development. Out of the amount spent, a specific and large percentage has been spent on the purchase of weapons and military equipments.

Weapon such as bombs play a dangerous and crucial role in the world. For example, consider the case of atom bombs dropped on Hiroshima and Nagasaki. This incident was horrible not only because of the large number of deaths, not because of the unpleasant medical results for the survivors, not because they were unnecessary, but only because they had been used in a hasty manner and quick decision without considering the fact that they

cannot be retrieved again. The bombs dropped on Hiroshima and Nagasaki were of heavy load. But today's bombs are smaller, mostly carried by the missiles and they can be used at extremely accurate position.

ENGINEER'S INVOLVEMENT IN WEAPONS WORK

Engineers involvement in manufacturing of weapons is unavoidable. The engineers, who design weapons, manufacture them, and use them have some reasons to support their involvement. The following are some of the justifying arguments.

(a) Take the case of an engineer who involves in the manufacturing of antipersonnel bombs. Antipersonnel bombs are most dangerous. When they explode, they evolve a shower of sharp fragments of steel or plastic on the victims. They can also be timed to explode after some hours of delivery. When they explode on a person, the removal of the fragments is a time-consuming task. The engineer who produces this kind of bomb clearly knows about this danger. When he thinks morally, he does not want to be involved in producing them. But for his involvement he may argue that if he does not do his job, some one else will do that. He also adds that by doing job he assures a steady income to his family.

(b) A chemical engineer who gets involved in the production of "napalm". (Napalm is a jelly-like petrol substance used in incendiary bombs) argues that only the government must take necessary steps to stop the production of napalms,

(c) Another engineer who is a specialist in controlling and guiding missile, says that he feels proud to be able to help his country through his involvement in the defence industry. He also adds that there should not be any more world war.

(d) A nuclear engineer knows very well about the dangers of increasing nuclear "arsenal" Arsenal is a place where the weapons are being stored. He argues that he is working very hard to reduce the risk of nuclear accidents.

From the above examples, it is clear that all over the world, talented engineers are engaged in the weapons work. They should think morally, before getting involved in weapons' production.

PROBLEMS OF DEFENCE INDUSTRY

Many nations give privileges to defence industry, but without any thinking on some serious problems that they may come across along with huge military buildings.

1. The defence industry faces the problem of waste and huge cost in implementing and maintaining a weapons system.
2. The defence industry is also facing the problem of "technology creep" i.e., the development of new weapons. It makes changes in the arrangements relating to diplomacy. It upsets all negotiations. It affects the political stability of a country.
3. It also faces the problems in maintaining secrecy. The secrecy in weapons development paves the way for corruption and also leads to create mistakes in the weapon system itself.
4. Every country allocates a large amount of its resources to defence sector. The amount spent in the defence industry creates only a few jobs when compared with the other industries.

It is very important for any country to think to what extent and how long they can divert their men, material, money and machinery into a sector which is not economically contributing.

To conclude, the use and development of weapons must be minimized, as they are the most hazardous to general public. So, before involving in the weapons development, engineers must take some personal decisions based on the individual conscience and the social and political issues of weapons technology

4.Engineers shine better as managers-Discuss?

Most of the engineers are experiencing the best methods of technical training like other professions. Many of the engineers move into managerial jobs. The reason being, many companies want to have the engineers as managers. Because, they have thought that in order to manage technological corporation, the technical understanding of the engineers is very essential. In addition to the above, the companies value the general strength of engineers in quantitative analysis, they value engineers' strong work ethics and their confidence in solving difficult problems.

Engineers are also interested in getting involved in managerial jobs due to higher salaries, great authority, increased responsibilities and increased prestige and recognition.

MANAGERS ACTING AS PROFESSIONALS

The process of changing from technical work to management requires many adjustments. It involves getting an improved knowledge about finances and scheduling, improved skills in coordinating and motivating the people and also the ability to make risk-taking decisions on technical considerations. In this case, engineers are said to be having ethical responsibilities on the basis of their codes of ethics. But the managers are not having such responsibilities.

In the past, managers were recognized as professionals. They ought to have higher education, which comprised of theoretical knowledge and practical knowledge. They also accepted the responsibilities relating to the promotion of public good by their activities. The social responsibilities movement stresses the need for larger responsibilities of managers relating to other employees, customers, dealers, suppliers, local communities and also to the

general public. But one ethicist argued that the social responsibilities of business is only to increase the profits and to satisfy the desires of the shareholders of the companies. Ethicist also argued that managers' ethics is only up to the maximization of profit for the stockholders. Engineers only have the responsibility to protect the public safety, health and welfare.

The basic ethical responsibilities of managers are to produce a good product or valuable service, only after taking into consideration maintaining respect for human beings, which includes customers, employees and the general public. So, while considering ethical problems, managers should consider first only the persons and safe products and not profits. But at the same time, profits are also essential for the successful running of business. So, the fundamental aim of both the managers and engineers should be to produce valuable products that are also profitable.

A good business and a sound ethics must go together, as the moral roles of engineers and managers are said to be complementary and associated with each other. As managers, engineers' moral responsibility is to produce safe and useful products that are also profitable. So, engineers have a specific tendency to give special importance to excellence in their work and showing ethical obligations to the public by goods promoted by their work.

On the basis of the above, the engineer-managers should have two responsibilities such as promoting an ethical climate and resolving conflicts. These responsibilities are explained as below.

PROMOTING AN ETHICAL CLIMATE

In a working environment an ethical climate helps to produce morally responsible conduct In organizations, an ethical climate can be established by a combination of formal organization and policies, informal practices and also by personal attitudes and obligations. In creating such a climate, the engineer-managers have greater responsibility.

Ways to create an ethical Climate:

In order to create an ethical corporate climate, the engineer-manager has to understand the features of ethical climate. They are as follows;

i) Ethical values must be accepted and appreciated by the managers and employees with its full complicated features. The responsibilities of the engineer-managers to stockholders, customers, employees and other supporters of the organization must be clearly informed.

ii) The sincere use of ethical language has to be recognized as a justifiable part of the company. This can be done by establishing a corporate code of ethics and also by including the ethical responsibilities in the job descriptions of all types of management.

iii) The top level management must establish a moral tone in words, in policies and also . by personal example. The management has to conduct periodic workshops on ethics and distribute brochures regarding social responsibility to all the employees of the corporation. In short management has to create a strong confidence among the employees that the management is more serious about ethics.

iv) The management has to establish some procedures for resolving conflicts. For doing so, the management must appoint suitable persons with whom the employees can have confidential discussions about moral concerns. The management must also educate the managers to solve the conflicts relating to ethical issues

MANAGEMENT OF CONFLICTS

An important managerial job in guiding and integrating the employees work is dealing with conflicts in an effective manner. Only the managers have the authority and

responsibility to find solutions for conflicts. They can do this by way of force. But the large use of force is a means of misusing the authority. The wrong use of authority generally results in ineffective maintenance of long-term productive relationships among professionals. In case of technological companies, who use engineer-managers, a successful management means drawing the fullest contribution of employees and tolerating and even inviting some kinds of conflicts. The manager's job here is to establish climates in which conflicts or disagreements are resolved effectively.

In case of engineering project managers, the following are the most important forms of conflict. They are given in the order of priority of overall feelings of the managers.

i) Conflicts based on schedules; This arises when the managers depending upon the support departments over which they have only limited control.

ii) Conflicts which arises in evolving the importance of projects and the department i.e which one is more important?

iii) Conflicts based on the availability of personal for a project

iv) Conflicts over technical matters; i.e., based on alternative ways and means to solve the technical problems within cost, schedule and performance objectives

v) Conflicts arises due to administrative procedure; i.e., over the extent of the authority of manager, procedures relating to accountability and administrative support.

vi) Conflicts of personality

vii) Conflicts over cost or expenditure

In the above forms of conflicts, the personality conflict is more difficult to solve. These conflicts over personality are blended with other forms of conflicts and also the project engineer-managers have only less training in solving personality conflicts. Both the ethical and technical disagreement will be beneficial to a corporation, when they have been properly managed. All form of conflict can be resolved by using the following principles.

Principles for Conflict Resolution

a) People must be separated from the problem

It does not mean that the problem alone is to be given importance. It means that the personal aspect of conflict has to be differentiated from the problem. This implies that the conflict should be viewed from the point of view of the people. People should be communicated in a clear and honest way. People should be included in the process of decision-making. Then only, even when their opinion of the problem is rejected, they do not feel dejected.

b) Focus must be only on interest and not on positions

This principle can be clearly applied to matters of ethical attitudes of people. rather than technical problem. "Positions" refers to stated views, not only of those serving as bargaining ploys but those, who may accurately express their best interests. For example, an engineer who is nearing his retirement, demands two or three percent royalty for a tool he developed. But the company thought that only 1.5% will be enough. After prolonged harsh arguments, the mediator between the engineer and the company finds that the engineer wanted such a high percentage of royalty in order to protect himself from the lawsuits in case of injuries from workers who use his tool. The mediator also found that the company can include the engineer under its liability policy. Finally, the engineer was happy to accept a royalty of around 1%.

c) Various Options must be generated

As per this principle, before deciding what to do, the corporation or the engineer-

manager has to produce variety of possibilities to resolve the conflicts. They have to establish creative options.

d) An evolution Criteria should be established

The engineer-managers must insist that the results of conflict resolution should be based on some objective standards. Within the corporate limits, it is more clear what kind of general standards have to be used in evaluating results of resolving conflicts. But at the same time, it is more important to establish a sense of fair process in which the goals are met, when the standards are beyond the goals :of efficiency, quality and customer satisfaction. If not, lot of disagreements would develop.

6.Who are referred as consulting Engineers?Explain?

Consulting engineers are those involved in private practice. For the services rendered by them, they will be paid some fees. They won't be compensated by salaries from employers. They are the sole employer of their practice. So they have greater freedom to take decisions on the tasks undertaken by them. There are some special responsibilities for consulting engineers in their jobs.

ADVERTISING

In case of salaried engineers who work in sales division, they have to involve in advertising too. But in companies, advertising regarding services, job openings are left to the advertising executives and the human resource department. In case of consulting engineers, they are directly responsible and have greater responsibility for advertising their services.

In the past, competitive advertising in the field of engineering was considered as a moral problem and was prohibited by professional codes of ethics. It was treated as an unfair act to gain or obtain jobs through advertisement. It was also believed that such kind of competitive advertisement result in frictions, reducing mutual respect and damaging the profession's public image.

Misleading advertisement occurs when products or services are made to look better than they actually are. This kind of deceptive advertisement can be done by many ways as follows: i) by directly telling lies ii) by telling half-truths iii) by way of exaggerations vi) by

giving false suggestions and implications v) through unclearness created by ambiguity, vagueness vi) through manipulations of unconscious and also by meaningless performance data.

Examples of deceptive advertisement

i) A consulting firm which actually take plays a very small role in a well-known project, publishes an advertisement which tells that the firm is playing a major-role in that project.
ii) A firm is involved in developing a new product . But it gives an advertisement that contains the picture of the proto- type of the product and creates an impression in the minds of the people that the product is readily available for sale.
iii) An institution shows the picture of proto-model of the buildings along with the gardening in graphics; it is producing an illusion about the building and infrastructure.

In case of consumer products, the manufacturers are allowed to suppress the negative aspect of their products in their advertisements. They are also allowed to exaggerate the positive aspects of their products. But at the same time, in case of advertisements like cigarettes, saccharin or tobacco products, as per the law, the advertisement must give importance to words relating to health warnings such as "cigarette smoking is injurious to health and chewing of tobacco is dangerous to health".

In case of advertisements of professional services, there are strict rules. The NSPE, (National Society of Professional Engineers), in its codes of conduct, have prohibited the following activities in advertisement of professional services.
i) The use of statements containing a material misrepresentation of fact or omitting a material fact necessary to keep the statement from being misleading.
ii) Statements intended or likely to create an unjustified expectation.
iii) Statements containing prediction of future success.
iv) Statements containing an opinion as to the quality of the engineer's services, and
v) Statements intended or likely to attract clients by the use of slogans, jingles or sensational language format.
So, there must be some strong restrictions on misleading advertisements.

COMPETITIVE BIDDING

It means offering a price in order to achieve **something in** return by that offer. The professional codes of ethics forbid the consulting engineers from involving in competitive bidding. They are restricted or prohibited from competing for jobs on the basis of submitting priced proposals.

But on the other extreme, industrial and construction firms were allowed to use competitive bidding. Because, they would be able to formulate cost estimates accuratly on the basis of fixed design specifications. But, the main task of consulting engineers is to develop some creative designs for solving unusual problems. So if they are allowed to use competitive bidding, it would encourage reducing safety and quality or padding and over designing.

But at the same time, if the engineering companies are restricted to use competitive bidding, then, the consumers have to depend mainly on the reputation and proven qualifications in choosing a company to make purchases. This will create the problem of how to determine the qualifications of companies in an equitable manner.

CONTINGENCY FEE

Consulting engineers have to make their own arrangements about payment *for* their services rendered. They must fix their fees with *a* sense of honesty and fairness. He should not request, propose or accept a professional commission on the contingent basis.

A contingency fee or commission is based on some extra ordinary conditions apart from the normal performance of satisfactory work. li a contingency-fee arrangement the consultant will be paid only when he succeeds in saving the money of the client. If he does not succeed he will not be paid any fees. Under this arrangement, the fee may be either an agreed amount or a fixed percentage of the savings to be realized. Today most of the construction engineers are paid only on this basis. So automatically, in case of a contingency-fee structure, the consultant's judgment will become biased. For example in case of civil engineers, in order to gain the fee, they speci1' inferior materials and designs in their work. They plan to stimulate imaginative and responsible ways of saving costs to clients.

So, consulting engineers should not adopt the contingency-fee arrangement. They must work for the safety and benefit of their clients with some moral concerns.

SAFETY AND CLIENT NEEDS

Consulting Engineers have larger responsibilities in decision-making concerned with safety, as they have a lot of job freedom. This job freedom creates some notable difficulties. Consulting engineers are having the option of accepting or rejecting the work related to "design-only projects".

For example, for a consulting civil engineer who accepts a specific design project of a building or designing a bridge, his job is over when he has completed the design. He can not hold any responsibility after that i.e., he need not supervise the construction work.

The above case and the like create some problems. Only consulting engineers can identify the areas of difficulty when the project is carried out. The clients may not have properly trained supervisors. Particularly, when any new or unsafe project is being undertaken, the clients may not have any idea whether their supervisors are satisfactory or not .On the other hand, a contractor does not want to point out the defects in the design as it affects his remuneration. This will lead to dangerous conditions, which affect the safety of the client's needs. It will also result in heavy property loss, waste of resources, environmental damage and even loss of life.

So, when the consulting engineers accept design-only projects, with some amount of moral responsibilities, they have to make at least on - site inspections on the project. They have to do this, in order to safeguard the clients from losses. Because, the engineers may know from their vast experience that some unsafe design could lead to a partial damage to the structure even during the process of construction work.

PROVISION FOR RESOLUTION OF DISPUTES

A large number of participants such as the owners, the consulting engineers and the construction firms will get involved in the case of large and complex engineering projects. Each participant has some amount of responsibility on his own. In such a case, there may be chances for overlapping responsibilities, misplaced control, indecision, delays and inability to solve disputes quickly. So in order to prevent the potential liabilities, the people party to the projects normally want to protect themselves. In this condition, solving the disagreements will be more difficult when the project lasts many years. In most of the

cases, the engineers are held tightly to the provision of the contract. They will be unwilling and would not take risk to introduce new ideas in order to avoid such liabilities as per the contract provisions.

Now a days, litigation has increased to a considerable amount. In the past, in the construction process, the design engineers would not have any lawsuit in case of any default. But to day, there are so many lawsuits against the consulting civil engineers.

As litigation is a laborious work involving plenty of time and cost, the consulting engineer has to make arrangements for resolving conflicts. These must be some contractual provisions for solving the disputes such as mediation-arbitration. The arbitrator has to solve the disputes first.

So, the consulting engineers must make some contractual provisions for solving disputes either through mediators or arbitrators.

7.How do Engineers act as expert witnesses and advisors?

Sometimes, engineers work as consultants to give expert supporting evidence in appropriate circumstances. The concentration of engineers may be on the past, such as explaining the causes of accidents, malfunctions and other activities and functions which involve technology. They also focus on the future such as public planning, policy making c, that involve technology. In general, engineers are often hired by one of the opponent parties of a dispute. This creates special ethical issues about the functions of the engineers. It is important to analyze how the engineers act as expert witnesses and advisers.

ENGINEERS ACT AS EXPERT WITNESS IN THE COURTS

In the judicial system, engineers can be hired, by either the plaintiff or by the defence to witness both the civil and the criminal proceedings. Some engineers occasionally, act as expert witness and some others may do such act as a routine work and they become specialists in forensic engineering. Forensic engineering means the application of engineering skills and knowledge within the judicial system. They may act as witnesses in the cases such as defective products, personal injury, damage to properties, traffic accidents and even air crashes. Their witnessing has been considered by the Justices while giving

judgment as to who has to be pald compensatory damages for injuries, loss of property or violation of rights. Their witnessing has also been considered in case of "exemplary damages. i.e., violation of rights by involving fraud, malice or other wrong doings.

Engineers are hired by lawyers to serve the interest of their clients. Engineers when hired, have obligations to focus their qualifications accurately when called by the court. They also have a responsibility of confidentiality. Their basic and primary responsibility is to be objective in finding the truth and telling it honestly. The proper role of engineers as expert witnesses, depending on the shared understanding, creates, moral responsibility within society. Their role must be understood in terms of the morally justified aims of a legal system with regard to the professional standards as per the codes of ethics.

The main objective of a legal system is to find out the truth about events perceived by the disputing parties. So, the primary purpose of the court system is to manage a difficult system of legal rights that explains legal justice. For promoting legal justice, the court system depends on the expert witnesses. For this work, the expert witnesses should be paid by the courts.

ABUSES OF ENGINEERS AS EXPERT WITNESSES

a) Hired Guns

When engineers are hired by lawyers to help them to exhibit the facts in a favorable way to their clients, they are called hired guns. As the hired guns, engineers break the standards of honesty and also violate paying due care while conducting investigations.

For example, a mason falls down while climbing on a wooden ladder and is injured very seriously. The mason files a case against the producer of the ladder for claims. In the court, the witnesses gave some conflicting testimony. Some said that the accident happened due to a crack in the ladder, while other argued that the mason climbed very carelessly and this caused the ladder to crack. The manufacturer of the ladder hired a structural engineer and he wrote a report in favour of the manufacturer.

In the above case, the engineer's act is improper. As per moral considerations, he has to give the facts and correct report. But as a hired gun, he is forced to give a false report. It is one kind of abuse of the qualification of the engineer

b) Financial Prejudices or Financial Influences

When engineers are paid by one adversarial party, it will create some bias in finding out the truth. This type of bias influences the engineer's investigations, supporting evidences and presentation of their qualification. When the engineers are hired on the basis of contingency-fee arrangement, the influence will increase strongly. In most of the cases, lawyers also pay contingency fee to serve their clients better. But in adversarial circumstances, contingency-fee-arrangement leads to bias judgment of expert witnesses.

Money influences in more ingenious ways. In case of forensic engineers, who make their living only from serving as expert witnesses they will always support the lawyers who have hired them.

c) Ego Biases

Many of the adversarial circumstances establish some competitive attitudes among the engineers who act as expert witnesses. This ego problem will greatly influence the judgment given by the expert witnesses. When ego exists among engineers who act as expert witnesses, they always have the opinion that their side is innocent and the opponent side is guilty.

d) Sympathy Biases

In all the courts, people's sufferings evokes a sadness. It is very easy to identify' the difficult situations of victims. Really, an engineer who acts as an expert witness may feel great sympathy for the opposite side when he understands the truth. This bias can disturb the disinterested investigations of the facts.

To overcome these influences, the engineers, when serving as expert witnesses, must take a special effort to maintain their integrity. The court must also depend on a balanced view of both sides, by examining the expert witnesses of opposing lawyers regarding possible biases.

ENGINEERS AS EXPERT ADVISERS IN PLANNING AND POLICY MAKING

Economists, sociologists, and other professionals play an important role in public policy-making and planning. Like them, engineers also play a very good role in planning and policy-making. In case of decisions regarding public policy-making and public planning involvement of technology is great.

While forming general strategies for society (policy-making), the public officials and the general public need some type of objective studies about the cost and benefits of alternative methods and systems of housing, transportation, energy use, land use and national defence. Likewise, in case of forming projects (planning), they require expert advice about the feasibility, risks and benefits of the projects.

In order to do the above properly, large amount of money is paid to consulting engineers for their favorable judgment about options. The results presented to the public are usually value-laden i.e., influenced by value assumptions based on political controversies. Engineers have to consider the values of honesty, public trust and respect for the common good.

As expert advisers, engineers have to give suggestions based on assumptions. So, clients always force the engineers to limit studies to the assumptions favorable to them. If the studies are of objective nature, they involve high cost in forecasting alternative assumptions. But the clients are not willing to pay for such studies. They only pressurize the engineers to use specific assumptions which are favorable to them. When engineers are frank in their reports about the restrictions created by these assumptions, their reports will be impartial only within limits. In this way, technical complicity leads to moral complicity.

In case of policy-making, policy forecasts are made by consulting corporations who use engineers as advisers. These engineers have to frame the policy only on the opinion of the public.

NORMATIVE MODELS OF ADVISERS

Engineers who serve as planning advisers and policy analysts, have the responsibilities to their clients and also to the general public. These responsibilities are always of conflicting nature. To avoid these conflicts the following normative models can be used.

a) Hired Guns

As per this model, the obligations of the clients are to be given primary importance. The studies made by the engineers must conform only to the desires of the clients. Assumptions on the uncertainties must be presented in the direction favorable to the case of the client.

b) Value-Neutral Analysts

As per this model, engineers have to be fully impartial with regard to their findings. They have to avoid bias and favouritism and also any form of recommendations. Their past has to be identified in all the options and analyzed carefully.

c) **Value-Guided Advocates**

As per this model, engineering consultants have to adopt strong supporting views in controversial problems. But at the same time, they must remain honest and independent in their professional judgments. They have to understand that the values are blended with facts. They must give primary importance only to the views of the general public.

The last model is the most appropriate one for thinking about policy analysis. Policy analysts and the engineers have a trust-based relationship with their clients and also have some responsibilities to the public. Both the clients and the public need help and guidance from the engineers in order to fulfill their needs. These recommendations should be expressed as the best judgment of the expert advisers.

To conclude, as expert advisers in public planning and policy making, engineers should have the following characteristics:

a) Honesty

Honesty is necessary to avoid deceiving and to be frank in giving all the relevant facts. It is also necessary to be truthful in interpreting the facts. Honesty in technical data is essential to be honest in engineer's role and for the values guiding his studies.

b) Competence

It means being well trained and having proper experience in the relevant field and also having the required additional skills for planning and policy making.

c) Diligence

It means carrying out the given job carefully and in a prompt way.

d) Loyalty

It refers to serving the interest of the clients. It includes avoiding conflicts of interest, maintaining confidentiality and expressing concern for the interests of the clients.

8.Explain Honesty?

Honesty:

- Honesty is telling the truth.
- Honesty is straightforward conduct.
- Honesty is being sincere, truthful, trustworthy, honorable, fair, genuine, and loyal with integrity.

Honest, trusting kids:

- Tell the truth despite consequences
- Voice their opinion in a kind, thoughtful way
- "Tell on" someone only when necessary
- Show and share their feelings
- Know their classmates and teachers care and want the best for them
- Feel and react without guilt
- Express themselves positively as well as critically
- Do your own homework

- Tell a friend the truth
- Explain the real reason you didn't turn in your homework
- Keep your eyes on your own paper
- Clean up your room after making a promise
- Give the cashier the extra money she gave you by mistake
- Write a report in your own words instead of copying
- Admit you made the mistake
- Keep a friend's secret
- Turn in a wallet full of money that you found

Be honest with yourself

- Accept responsibility for your own actions; don't blame others.
- Be honest about your feelings.
- Face issues as they arise.
- If you are considering lying, try to think of the consequences.
- When confronted with a situation, think of others.

Proverbs and maxims

- Truth exists; only falsehood has to be invented.
- The truth is more important than the facts.
- In the mountains of truth, you never climb in vain.
- If you tell the truth, you have infinite power supporting you.

More quotes about honesty

- There is no wisdom like frankness.
- A harmful truth is better than a useful lie.
- Honesty is the best policy.
- Honesty is the first chapter in the book of wisdom.
- One falsehood spoils a thousand truths.

Heroes and heroines

Confucius was a Chinese philosopher who believed that a person's first duty was to be virtuous.

Cochise was a Native American leader who was known for his honor and for keeping his word.

Barbara Jordan was a remarkable Congresswoman who was a model for honesty in politics.

Martin Luther was a religious leader who led the Reformation movement (against the existing church) with honesty and courage.

Put honesty into action

- Thank someone in your family for being honest.
- Tell your parents about a mistake you've made.
- Tell the truth when you've done something wrong.
- Compliment a friend for being honest.
- Express your real feelings without anger, without blaming others, without exaggerating, and without hurting the feelings of someone else.
- Turn in something that is lost and encourage others to do the same.

- When someone wants to copy your work, politely explain that it isn't right and that it's best to do your own work.
- Admit a mistake or error in judgment you have made and apologize to anyone it might have affected.
- Do your schoolwork honestly
- Be truthful with your friends and thank them for being truthful with you.
- When you ask someone to be honest with you, don't get angry with them if their honesty isn't what you wanted to hear.

Community service ideas

- Write a letter of thanks to a politician or community leader who has taken a stand on a controversial issue.
- Visit a senior citizen center to play board games with the residents. Make very honest moves as you play.
- Share the meaning of honesty with your family. Ask them to share their ideas with you.
- Remind members of your community to be honest. Decorate public areas with signs telling about the value of honesty.
- Create a classroom honor code. Write it down and hang it up in the classroom, so that everyone can see it all year long.
- Plan a class field trip to a daycare center to tell stories with themes of honesty to young children.

8 great reasons to tell the truth

- Telling the truth lets everyone know what really happened. There's less chances of misunderstandings, confusion, or conflict.
- Telling the truth protects innocent people from being blamed or punished.
- Telling the truth allows everyone to learn from what happened.
- You usually get into less trouble for telling the truth than for lying.
- Other people trust you more when you tell the truth.
- You don't have to tell more lies to keep your story straight.
- You gain a reputation for being truthful - a trait that most people value.
- Telling the truth helps you feel secure and peaceful inside.

10 tips for being more truthful

- Make a commitment to tell the truth and honor it.
- Tell someone about your commitment and progress.
- Think before you give a dishonest answer, explanation, or reason.
- Be careful of when and how you use exaggeration, sarcasm, or irony.
- Be careful not to twist the truth or leave out part of it.
- Don't indulge in little white lies; don't get caught in cover-ups.
- Watch out for silent lies. When you know about a lie and keep quiet, the lie lives on.
- When you catch yourself lying, throw your mouth into reverse and tell the truth.
- Talk to yourself quietly and ask what is the best thing to do.
- Treat your to something special with you tell the truth even when it's hard.

More activities

- Write and perform a skit in which you and others debate the saying "Honesty is the best policy."
- Discuss what is means to "live a lie."
- List examples of what honesty means to you and role-play.
- Research whistle-blowers or people who go public about an unfair, unsafe, or unethical practice in the workplace or other place.
- Study honesty and dishonesty in advertising. Read or look at ads - in the news, magazines, on tv.
- Learn about the relationship of honesty and (mental) health.
- Learn about honesty in scientific or medical research.
- Compare national honesty (crime statistics) with local honesty. Which is higher?
- Research cultures past and present to learn their views of honesty.
- Find out how your school handles dishonesty. Are there student guidelines about cheating, stealing, lying, plagiarism, and other issues?
- Survey your class to find out how honest students are.
- Collect pictures of people throughout history who have been known for their honesty.
- Write a jingle about honesty or dishonesty.
- Read stories about honesty.

9.Explain business ethics?

We need to study business ethics to make better decisions for ourselves, the businesses we work for and the society we live it.

- **Society as a Whole Benefits**
  - Corporate compliance with the law is insufficient alone to ensure ethical conduct b/c the laws do not encompass all expressions of ethical behavior.
  - stakeholder theory vs. profit maximization theory

- **People Feel Better**
  - Studying ethical concepts and theories will help individuals define ethical conduct and learn to use a strategy or framework for making decisions.

  - Studying ethical concepts and theories helps us understand ourselves and others better.

Unethical Behavior Can Be Very Costly

- Corporations are in positions of power that allow them to do greater damage to others when they act unethically or socially irresponsibly.
- Increased exposure to liability and the passage of onerous legislation controlling/monitoring business activity.
  - **Civil and criminal actions against wrongdoing corps. & their executives**.
  - Congress passed the Sarbanes-Oxley Act of 2002 which increased penalties for corporate wrongdoers & established rules designed to deter and prevent future wrongdoing.
  - **Purpose of Statute**: Encourage & enable corporate executives to be ethical & socially responsible.
- Negative impact of public criticism on reputation and corps ability to earn profits.
- Negative impact within the firm

We will examine four ethical theories:

- rights theory
- justice theory
- utilitarianism
- profit maximization

These four theories can be classified in two ways:

Teleological Ethical Theories = Focus on the consequences of a decision

Deontological Ethical Theories = Focus on the decision itself.

RIGHTS THEORY

11. Encompasses a variety of ethical philosophies holding that certain human rights are fundamental and must be respected by other humans
12. Focus is on each individual member of society and his/her rights
13. Each of us faces a moral obligation not to harm the fundamental rights of others

Modern Rights Theories

- Propose mixed deontological theories b/c strict Kantianism's duties are absolute and sometimes create inappropriate results.
- Abide by a moral rule unless a more important rule conflicts with it. (In other words, don't compromise a person's right unless a greater right takes priority over it.)

Major Strength:

9. It protects fundamental rights unless some greater right takes precedence.

Major Criticisms:

10. Difficult to achieve agreement about which rights are protected. (Rights fundamental to industrialized nations may be unknown or severely restricted in developing nations. Doesn't consider the costs or benefits associated w/rights

11. Creates a sense of entitlement that may have a negative impact on motivation.

JUSTICE THEORY

- John Rawls, published A Theory of Justice, in 1971
- Argued it was right for gov'ts to redistribute wealth in order to help the poor and disadvantaged.
- **Greatest Liberty Principle**: Each person has an equal right to basic rights and liberties. This is limited by the Difference Principle: Social inequalities are acceptable only if they cannot be eliminated without making the worst-off class even worse off.
- **Focus is on outcomes**. Are people getting what they deserve?
- **Strength**: Basic premise - The protection of those who are least advantaged in society.
- **Criticisms**: Doesn't examine the costs of producing the equality.

UTILITARIANISM

- Identified most with 19th century philosophers Jeremy Bentham and John Stuart Mill
- Requires a decision maker to maximize utility for society as a whole
- Max Utility = achieving the highest level of satisfactions over dissatisfactions
- It judges our actions based on outcomes (teleological)
- **Strength:** Easy to articulate the standard of conduct – Merely do what is best for society as a whole.
- **Criticisms:**
  - Difficulty in measuring benefit & harm to all members of society.
  - Unequal distribution of costs & benefits may lead to detrimental results for a particular class or group of people.

PROFIT MAXIMIZATION

- Maximize the business' long-run profits within the limits of the law
- Based on the Laisse Faire Theory of Capitalism first expressed by Adam Smith in the 18th century
- Argues total social welfare is optimized if humans are permitted to work toward their own selfish goals
- The role of gov'ts and the law is limited solely to ensuring the workings of a free market (by NOT interfering w/economic liberty, eliminating collusion among competitors, & promoting accurate information in the marketplace.
- **Strength:** Allocation of society's resources to those units that are most efficient increases overall productivity and maximizes total social utility.
- **Criticisms:**
  - Doesn't concern itself with HOW wealth is allocated in society. Market imperfections and a person's station at birth interfere w/his ability to compete.
  - The ability of laws and market forces to control corporate behavior is limited

Thinking critically: evaluating arguments logically

12. **Non Sequiturs** = A conclusion that does not follow from the facts or premises one sets out.

13. **Appeals to Pity** = Generate support for a proposition by focusing on a victim's predicament.

14. **False Analogies** = An analogy essentially argues that since something is like something else in one or more ways, it is also like it in some other respect. We should make sure that the two situations are similar enough to make the analogy valid.

15. **Begging the Question** = Taking for granted or assuming the thing you are trying to prove; circular reasoning.

16. **Argumentum ad Populum** = Argument to the people. An emotional appeal to popular beliefs, values or wants. The fallacy is that just because many or all people believe something does NOT mean it is true.

17. **Bandwagon Fallacy** = Similar to argumentum ad populum. States that we should do something merely because one or more other people or firms do it.

18. **Argumentum ad Baculum** = Argument to the club. The arguer uses threats or fear to bolster his position.

19. **Argumentum ad Hominem** = Argument against the man. This tactic attacks the speaker, NOT his reasoning.

20. **Argument from Authority** = Arguments from authority rely on the quality of an expert or person in position of authority, NOT the quality of the individuals argument. Similar is the argument to reverence or respect.

21. **False Cause** = This fallacy results from observing two events and concluding that there is a causal link between them when there is no such link. This occurs b/c we do not attempt to find all the evidence proving or disproving the causal connection.

22. **The Gambler's Fallacy** = Results from the mistaken belief that independent prior outcomes affect future outcomes.

23. **Reduction and Absurdum** = "Slippery Slope" argument. Carries an argument to its "logical" end without considering whether it is an inevitable or probable result
24. **Appeals to Tradition** = Infer that because something has been done a certain way in the past, it should be done the same way in the future.

25. **The Lure of the New** = Opposite of "appeals to tradition". The idea that we should buy something merely because it is "just released" or "improved".

26. **Sunk Cost Fallacy** = An attempt to recover invested time, money and other resources by spending still more time, money and resources.